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AUGUST 1967 THE NAVAL AVIATION SAFETY REVIEW

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Flying the F-8 from the Break to the Deck

The article that follows first appeared in the Attack Carrier Air Wing NINETEEN LSO Newsletter. Its authors are two well qualified first tour LSOs serving on their second combat cruise. Their purpose in writing was to help refresh F-8 drivers in carrier landing techniques and to get them to think about the numerous factors involved in a carrier landing pattern.

As it stands, the article was written by F-8 pilots for F-8 pilots and a few of the techniques may not apply to other aircraft. But if it creates discussion or even raises the hackles on some of the older, bolder types, then it will have served its purpose.

LSO debriefs *should* only serve to tell you what you already know about your pass. For this reason the saying, "To thine own self be true," is paramount in your private critique of the pass. We've all known the disappointment of having what we felt was one of our best efforts called only a "fair" by the LSO. But LSOs are human too, and if this is more than just an infrequent occurrence, you had best question your own honesty. That many LSOs must see something you're not admitting to yourself.

Spotting the deck falls into this category of honesty. If you are spotting the deck (and we all have at one time or another), you're doing yourself a disfavor. Your mind's eye, judging a 200′ landing area from a 3½-degree relative angle while closing at over 175 fps, can't predict the point of zero relative motion (the hook touchdown point). Especially

when the hook is some 50′ behind and 13′ lower than your eye. But the lens can show it to you because it considers all these factors for you.

Think back to when you were flying night MLP. You didn't spot the deck then because you had no reason to. You were not concerned about getting aboard. You were solely concerned with watching the ball all the way down the slope and keeping it in the middle. Seeing it in the middle as you touched down and as you went past the lens was your point of pride. It should be even more so now. If you accomplish the primary objective of flying the ball all the way, then the secondary objective, getting aboard, will result.

While it won't replace sex, the satisfaction of knowing in your own mind that you flew an "OK 3," then having the LSO confirm it, can be the next best thing.

Just to see how long you watch the lens, test yourself with this sometime: in the fraction of a second from the time you grab a wire until you stop, do you see the ball elongate on the lens as you roll out? You should.

Definitions

Let's discuss a few of the common terms which are used in an LSO's shorthand description of a pass.

(Over the Top)—All this is really, is a graphic picture of the flight path of the aircraft. "Over the top" is almost a misnomer, for if the straight line were to represent the ideal glide slope then would be a description for, "low in the middle, stop the ball from going high, then holding the original correction to a come down." What we'd like to emphasize is the last part of the arrow, the . This means "come down," whether it is short of the 1 wire or up on the number 2 elevator.

CD (Come Down)—A higher than optimum sink rate. There's a fine line between a CD and a hard landing. (By the way, expect to have the LSO debrief you as to why, i.e. DN; EG, etc.—Ed.) The point is that a correction was made to keep the ball from going high, but the optimum power/attitude was not re-established in time (if at all) to prevent a higher than normal sink rate on landing. This is why, when you have gone HIC (high in close) or HAR (high at the ramp), you'll hear a power call, while you still see the ball above the datum. You will also hear an attitude call in this situation at times. This is an attitude call to get the nose back up where it belongs and the aircraft back into a landing attitude. To save the struts, we want you to hold the high ball and parallel the optimum for a 4 wire or a bolter.

Getting back to the basic idea that you're *flying* the airplane, we hope that you'll save face by beating us to the power call and possibly get an "OK (AR) 4" out of it instead. This brings us to the next two terms.

IC (In Close) and AR (At The Ramp)—Both are sometimes used interchangeably, but specifically, IC refers to the area from about 1000′ out to where the aircraft is virtually a split-second from the ramp. AR describes the area from about two aircraft lengths short of the ramp to the 1 wire.

Ideally then, a CDIC is more dangerous than a CDAR, but if either results in an **LOAR (low at the ramp)**, then both are equally as bad. Not to

mention the effect of a CD on an aircraft's usually much abused struts.

B (Flat)—This stands for a less than optimum sink rate and is the opposite of a CD. If you have a centered meatball in close but go BAR (flat at the ramp), you'll either get a 4 wire or bolter. If you get a LOBAR 3 (low and flat at the ramp), this is more desirable than a LOBAR 1, because it indicates that at least a correction was being made for the low condition. But in either instance, an LOAR is undesirable.

BAW (Flat All The Way)—This is best described by the diagram which really means you had a low start and gradually brought it back up so that you were flying up through a centered ball in close or at the ramp. This calls for a very tricky correction at the last second to keep from boltering, and few pilots can accomplish it without getting a three-point landing. So the answer here is to get it up in the center sooner.

These are basic calls that are true for any type aircraft on final in a carrier pass. Let's consider now what comes prior to that portion of the pass.

Pattern

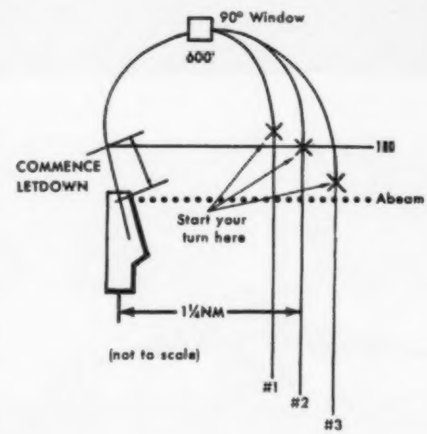
As a result of the vagaries that fan breaks and not breaking on the fox corpen introduce, we sometimes find ourselves at a less than optimum 180 position. What should we be looking for? Well, for comparison's sake, let's consider the 90 as you do the low reversal in a gunnery pattern. It's a pretty small window that you have to pass through to get on the correct iso-G curve for a good firing run.

By the same token, the 90 is really the start of your pass. From there on around, you are flying the ball. If you go deep, aft of the window, and the guy behind you makes it through the window, then he'll be cutting inside of you and we'll have to wave you off for being long in the groove. On the other hand, if you're inside, forward of the window, then you'll have too short of a groove. Both the APC and you in manual need *no less than 10 seconds wings level* in the groove to get your speed under control.

If you're close at the 180, then you'll either be wrapped up with a high airspeed, or you will overshoot and have to come back to centerline. This lessens the wings-level time you need to get an accurate picture of what power is required to keep the ball centered.

If your 180 is too wide, your 90 may be the correct distance aft of the ship, but offset too far from the centerline. This will result in either being long in the groove, or in an angling approach. The late lineup which results is almost guaranteed to create a CD.

So the 180 is like the perch. It can be played from different positions, just as long as you make it through the correct low reversal point. The abeam Position IAW CVA/CVS NATOPS is 1¼ NM on the DME, abeam the ship. Take a good look at your DME and make a mental picture of how the ship looks. The diagram and explanations show various means of reaching the correct 90 from the particular 180 at which you may find yourself. In order to allow for the 1½ NM straightaway on final, the 180 (the turn point) will fall a given number of seconds after marking abeam the LSO platform, depending on the wind.



1—Less than 1¼ NM when abeam. Delay your turn just a few seconds and then make a tight, high powered turn into the 90 box. Lessen your bank and power to leave the 90 only slightly fast. Don't be afraid to use that rudder in the turn—it'll get the nose around a lot faster.

2—The ideal 180, 1¼ NM abeam. A normal 30-35-degree angle of bank turn should put you in the correct 90 position.

3—Too wide—more than 1¼ NM abeam. Start your turn prior to reaching the 180 position. Use a shallower bank than normal to prevent the 90 from being too far offset.

The ideal abeam position described is good for up to about 35 kts of wind over the deck, but on the occasions when it pushes upwards of 40 kts, then you'll have to start the turn correspondingly sooner for all three positions.

Attitude

Since the F-8 fuselage, and hence the thrust vector, is relatively flat as compared to the cocked-up

A last second go-for-it usually results in a three-point landing and missing a trap.

attitudes of the F-4 and A-4 models, we should be more aware of the difference between power and attitude, especially as it applies in the last few seconds prior to touchdown. Since they are interacting factors it is difficult to separate one from the other, but let's consider *power* as controlling the horizontal vector (or where the aircraft will touch down) and *attitude* the vertical.

In the F-8, a pronounced increase in nose attitude as the aircraft crosses the ramp serves only to decrease the hook-to-ramp distance. The result is a 2 wire engagement when a 3 wire would normally have been made. That's all a flare does—it changes the attitude of the aircraft. It has no time to slow down the sink rate. But, if it is applied a little farther out on the slope, it will decrease the sink rate. If you can think of power as a driving vector to move you farther up the deck, this will perhaps best help solve the dilemma of the APC pass where you start to settle just as you get to the ramp. If you pull your nose up, "Whammo—a 1 wire!!" What happened? APC, because of its inherent design limitations, couldn't respond to the demands quickly enough and the increased attitude could do nothing but drop the hook lower. By overriding APC at this point and using power to increase your horizontal vector, you can move your touchdown point farther up the deck, with virtually no change in attitude (if you weren't too far from optimum in the first place). This isn't to advocate that you break APC in close every time and accelerate into the wires like a scalded ape though.

Another word about attitude and how it effects the F-8. We often see a bird go slightly high at the ramp then try to get it all the way back in the center by really dropping the nose. That's a classic example of get-aboard-itis, and all it will usually result in is a three-point landing (hard on nose struts) and hiking the hook over what would have been a 4 wire trap. This last second "go for it" is usually unsuccessful compared to the technique of dropping the nose slightly and immediately re-establishing the landing attitude in order to hold the high ball for a 4 wire and get the hook down where it belongs.

Something that makes any LSO quiver is the instance when a guy drops his nose farther out in the groove. Not only does the APC reduce power, but valuable lift is given away. This is the paradox of the F-8; a slight nose attitude increase will not result in any appreciable change in flight path for a second or two, but a slight nose decrease will result in an immediate increase in sink rate. Given a constant power condition, the nose drop will not accelerate the aircraft as much as a nose pull up of the same degree will decelerate it.

This drop nose in close (DNIC) which makes a 1 wire trap out of a 3 wire pass is a pretty good clue that the pilot was spotting the deck at the last moment.

In this same area of critical lift, remember that any time your wings aren't level, the lift vector isn't going straight up. A last second line-up correction will be just enough to increase the sink rate by 2-4 fps. When you have 10′ of hook-to-ramp clearance with a centered ball, one foot of altitude deviation can move your touchdown point 14-16′. You can't afford to flog it around like the boys on the big boats can with their 16′ of clearance.

There's nothing more pitiful to us on the platform (not to mention the guy in the cockpit) than to hear an F-8 go "oomph!" as it squats on the deck ahead of the 4 wire with the power back from coming down, and then see it bound back off into the black night air. But let's not kid ourselves, it's better than hearing you from the net as you touch down somewhere short of the 1 wire.

Anyway, the point of this is that attitude versus power in the F-8 is a twilight zone during those last few seconds prior to touchdown. If you pull the nose up in the F-8 you will usually touch down just a little more cocked up in the same place as you would have if you'd left the nose alone. That's why a "no lower," which is an APC pass call for an increase in attitude when it is given in the middle of an approach, is an appropriate call to stop a sink rate. There is time for the increased attitude to generate additional lift and for the APC to add the desired power. By the same token, a "power" call in close is used when instant response is desired to move your touchdown away from the ramp (decrease sink rate) where an attitude change wouldn't have time to take effect. Incidentally, a power call means that we want you to break APC and make an immediate addition of power (as much as 100 percent if necessary) and to get your attention on the meatball and what it's doing. It's a pretty good bet that if you get a second power (100 percent) call, you are in the marginal area.

As you all should know, the proper technique for a waveoff is to hold a doughnut with 100 percent. In an in-close situation, this will virtually mean a landing attitude. The same applies to a "power" call—so don't go honking the nose up.

Techniques

Let's consider the F-8 in the two separate types of power controlled passes, manual and APC.

APC—First, how many of you engage the APC soon enough prior to reaching the 180 to get an accurate check of the angle of attack versus the IAS, plus APC response? If you don't already know what you should be looking for on the gages, then look it up in the handbook before you decide that the APC is carrying you fast. You could have checked it the first time and probably gotten aboard with a manual pass.

The 90 can be reached from a close 180 in APC, but the tight turn can result in the APC getting you up to 170 kts as it tries to maintain a doughnut. At the gross weight we're flying and the grooves we're looking for, this is just too fast for a start.

Rather than be fast, you might try flying from the 180 to the 90 in manual and holding no more than 155 kts. This will give you about 15 units angle of attack in a 45-degree bank, but that is acceptable if you keep the power up and watch what you're doing. When you reach the 90, roll the wings toward level to intercept the desired turn into the groove while you're reducing the power. The angle of attack will go to 13 units or less. As it does, you can engage the APC and fly a normal pass the rest of the way. Be careful not to engage it with more than 13 units or you'll get 100 percent. A high, fast start will develop before you can catch it.

Now, where is this elusive 90? Rather than offer a DME distance, since from here on out you're mostly heads out of the cockpit, it is better to think of the 90 as being at 400-450′ when you pick up the ball as it comes on the *middle of the lens*. If it's low then your 90 was deep and if it's high then you were close.

While the APC is definitely a good deal, it is still only a device and it can't think as fast as you can. Even the automatic landing system for the F-4 only has a 90 percent boarding rate, which is little better than the average competent naval aviator. The best way to approach the APC is to stay ahead of it. Just because your left hand is going along for the ride doesn't mean you don't take clues any more.

Say the ball starts to go high and you ease the nose over ever so slightly. The indexer doesn't even lose the doughnut. You feel the throttle inch back and hear the engine ease off just a little. The ball stops just a little high; it'll even sit there for a few seconds, but *look out* ! ! ! At ½ mile, you can move 8′ vertically before you see the ball move. As soon as you stopped the ball, you should have re-established the correct attitude in order to get the power back on.

Get everything going for you. Keep your scan up, just like you learned ages ago: meatball, line-up and angle of attack. Listen to the engine, feel the throttle move and *stay ahead of the airplane!*

APC, as stated earlier, is only mechanical and has limitations, Hence, when you find 37 kts of

wind or more over the deck, the hole behind the 27-C is such that if you respond to the sink rate with APC (increase the attitude), the APC is just too slow. In these high wind conditions, an approach should either be flown in manual or you should plan to break APC prior to reaching the burble, which is usually about 400-600′ behind the ramp.

The same applies to a pitching deck. You may want a little faster response than the APC can provide. Use it to get set up, but you may need to break it in close to counter a deck that is moving rapidly upward. Speaking of the pitching deck, if we tell you it's dampened out and is steady, then fly the ball as always. We'll let you know if it starts to move.

Where APC is at its best is on those black nights (aren't they all?) when you have no horizon for nose attitude reference. The best gouge for being set up when you get close enough to work the ball is to make CCA talk you down to 1 mile. At 3 miles you can barely see the datums, and at two, the ball is so thick that it won't show trends until well developed. Use the CCA operator. That cat sitting in an air-conditioned room, sipping coffee between aircraft, can give you plenty of good dope out there where the ball is still indistinct.

When he says, "Commence rate of descent," ease the nose over and set up a 600-700 FPM rate of descent and then *trim it there!* Keep flying those gages just like you were in the clag. Get your lineup just as soon as you can and check it every few seconds, but rely on the CCA controller to tell you where the glide slope is. Even at $1\frac{1}{2}$ miles when you can see the ball, listen to the controller to pick up any trends that you may not spot right away. When you get in so close that he can no longer work you, he'll say, "Check the ball"—*then* call the ball and we'll give you a cheery greeting, plus info on the wind, etc.

Manual

Making 1 out of 5 passes in manual is the minimum to keep us the red-hot, stick-and-throttle fighter pilots that we are. In a manual pass, you've gotta keep that scan going, that's why we say you should scan in APC just as in manual. APC can make you lazy and break down the habit pattern of a good scan if you let it.

The fundamentals of a meatball pass are basically included in the three steps of flying the ball—correction—stop correction—reestablish to optimum. We won't go into any more than that. While we like to hear minor power corrections in a manual pass because we know then that the pilot is working the ball smoothly, we hate to see those big smoke signals in the groove that mean the hamburger in the cockpit is banging the throttle off both stops. It means that he's behind the bird and that we'll have a hard time second-guessing what he'll do next—and he probably will too.

So there you have it. We bring up what may seem like fundamentals to many of you because we witness daily a wide variety of mistakes which indicate that some of you have either forgotten them, or just aren't thinking.

If this article has made you think about some points that you perhaps took for granted, then we're only partially satisfied. We want to see these thoughts take substance in improved flying "from the break to the deck."

If you disagree with some of our points, we'll be glad to discuss them with you. Or if you have a different technique that seems to work, then let us know.

Use that trend analysis sheet not just to show off how many "greenies" you've got, but to look at your own passes for trends. Be honest with yourself. Then come out and receive the professional satisfaction of getting an "OK 3." We're really on your side. We'd like to give OK's every time. There'd be fewer ulcers between us all.

Short Snorts

Violent exercise after 40 is especially harmful if you do it with a knife and fork.

GCA Confusion

On one of those dark horizonless nights, an F-8 pilot was about one minute away from his estimated approach time to the carrier. At this time the pilot discovered that his tacan was not operating properly. Upon informing the CCA operator by radio of his situation, he was directed to join on an A-4 which was about to commence the first of a chain of CCAs.

After a hairy but succesful joinup, due to a combination of reduced visibility (an additional hazard to night flying) and different model aircraft, the section settled down three miles away from glide slope interception. At this time, the CCA controller directed the *Skyhawk* to go around in the waveoff pattern and for the *Crusader* to continue his approach. By the time the F-8 pilot had performed his landing check, he was closer to the carrier than normal. Consequently, upon reaching the point where he was to commence final glide slope descent, he was 20 kts fast. Extra concentration on the gages got the pilot on glide slope and on speed just in time to receive his "go-visual" instruction from the CCA operator. Expecting to instantly see the meatball and the normal deck lights on the carrier the pilot was shook to see only a few lights in an unrecognizable pattern.

To the pilot, it seemed like several long seconds until he was executing a full power waveoff. Another second later, the radio echoed the LSO's voice to "waveoff, waveoff, waveoff." The next trip around calmed everyone's nerves when the pilot got aboard safely.

Subsequent debriefing aboard the carrier revealed several incidents which almost led to accidents. Not only did the F-8 pilot have some electronic failure (tacan) but the signals on the carrier were confused. The CCA controller was not aware that his ship was not ready to receive aircraft, so the mirror and deck lights were off. The confusion of lights viewed by the pilot were on the fantail and superstructure.

The combination of an abnormally fast final approach entry by the F-8 pilot and then not seeing the lights he expected to see, (meatball and deck lights) almost caused him to fly into the water. The "waveoff" message from the LSO and the pilot's simultaneous decision to go around stopped the F-8's descent about 50′ above the ocean. The LSO stated he was looking horizontally at the *Crusader's* lights when a quarter of a mile out.

The F-8 pilot's closing statement to this hairy situation is noteworthy. "Don't try to figure out strange lighting or wonder where the meatball is when on final. There is only one procedure to follow; full power, climb and get right back on the gages. This seems to be a simple task, but those who have not had it told to them in this way, might also be suddenly shook as I was. One last thought about going visual at night during any landing approach: when cues for altitude (CCA, meatball, VASI, etc.) are not visible, it is a natural tendency for the aircraft to go too low. This happened to me and I managed to escape a crash by about one fuselage length."

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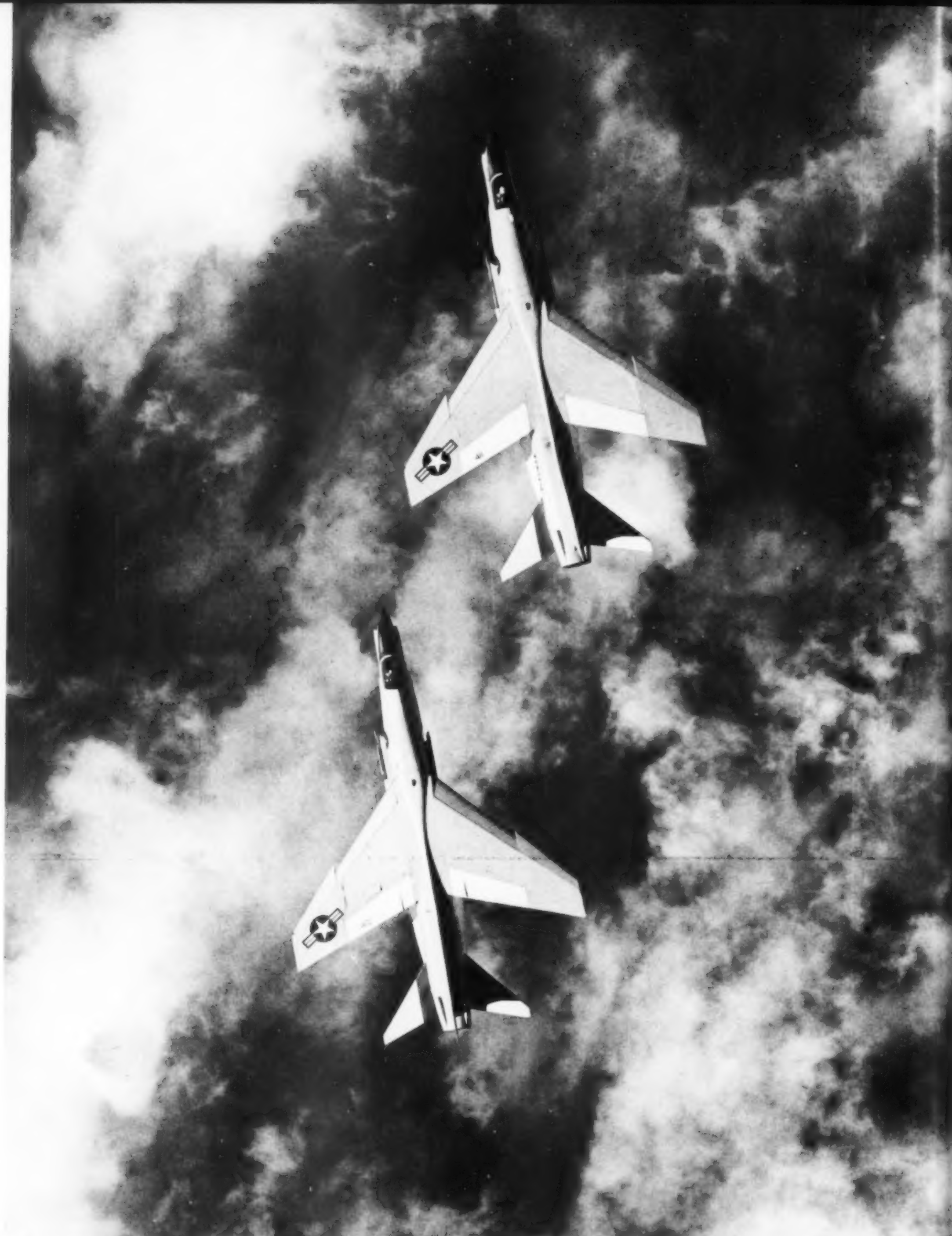
GOOD GRIEF!

While taxiing downwind parallel to the duty runway, the pilot of a US-2B was startled to observe a length of white string begin to wind onto his port prop. The pilot stopped the aircraft and set about tracing the string. He found that it originated from a paved area to his right across the runway and terminated off to port at the cross-string of a kite flying 150 to 200' over a nearby road. As the string continued to wind up on the prop the kite was observed to enter uncontrolled flight and it subsequently crashed approximately 50 yards north of the road. Ground control was advised of the incident and NAS security police were dispatched immediately to the scene. The wreckage was recovered, but a thorough search of the area failed to turn up any leads regarding the operator of the kite. After returning to the line, the pilot laboriously unwound 150' of string from the port prop of his aircraft. Kite flying in the immediate vicinity of the airfield has been curtailed.



Following cross-under the wingman overran the leader, stopping with his tail abeam lead's nose.

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Some Common Causes of Formation Collisions

By COL J.H. Reinburg, USMCR

It is basically the wingman's responsibility not to run into his leader. This is, however, a two-way street and the leader must also be fully aware of his responsibilities.

In the military services most midair collisions between aircraft are associated with formation flying and related tactical parade maneuvers.

NATOPS Flight Manuals for each model have basic instructions on formation flying, join-up, rendezvous and break-up. The instructions for different model aircraft vary slightly only to the extent necessitated by design variations and other peculiarities.

Radio is the primary means for issuing signals in formation flying and related squadron maneuvers. Handed down from the days before radio are: hand and head signals for in-close formation flying; blinker light signals for night formation work; and aircraft maneuvering signals, which are useful especially in case of radio failure or a desire to maintain radio silence.

To illustrate what can happen when there is a dearth of signals or when they are misunderstood or not observed, let's review a few related accidents and their cause factors.

Weak Head and Hand Signals

Two pilots in F-8E aircraft were on an authorized formation cross-country hop. Upon descending through 5000′ for landing at their home base, the leader directed a switch to tower frequency. He then gave a power reduction signal to the wingman by nodding his head. Quickly thereafter he retarded his throttle to idle RPM (nozzles closed). Airspeed had stabilized at 260 kts with the wingman tucked in on the port side, and the time had arrived for him to cross under to the starboard side anticipating the normal port turn prior to entering the pattern. Upon arriving in position on the starboard side, the wingman realized that he had excessive forward motion so he further reduced power to idle (nozzles open). The action was not quick enough because he had overrun the leader, finally stopping with his tail even with the lead's nose.

The wingman had been alternating his glances between the leader and the airport. Their approach position called for a starboard turn so the leader gave quick head and hand signals for the turn and a power increase. As a result of the poor combination of signals, formation flying and an unexpected starboard turn, the *Crusaders* merged. Both aircraft separated out of control and the pilots ejected safely.

This accident resulted from a combination of air collision causes: (1) Poor wingman positioning; (2) Hand and head signals not easy to see and not fully understood; (3) Divided scan, especially that of the wingman.

Wingman Joins Up Unnoticed

Recently, two A-4s were flying a buddy tanker practice mission. The leader completed the checkout first, then headed for the ship. He looked for but did not observe his wingman joining. A steep 70-

Text continued on page 12

. . . did not observe his wingman joining.

Hand signals . . . do not lend themselves to the A-6A.

The Proper Hand and Head Signals

Following are the standard hand and head signals from NWP 41(B). Observe them closely; they *will* assist in preventing an accident.

Flight Signals Between Aircraft

I: General Conversation

SIGNAL	MEANING	RESPONSE
1. Thumb up, or nod of head.	Affirmative (I understand).	
2. Thumb down, or turn of head from side to side.	Negative (I do not know).	
3. Hand cupped behind ear as if listening.	Question (repeat). Used in conjunction with another signal, this gesture indicates that the signal is interrogatory.	As appropriate.
4. Hand held up with palm outward.	Wait.	
5. Hand waved in an erasing motion in front of face, with palm turned forward.	Ignore last signal.	
6. Hand help up, with thumb and forefinger forming an "O" and remaining three fingers extended.	Perfect, well done.	
7. With forearm in vertical position, employ fingers to indicate desired numerals 1 through 5. With forearm and fingers horizontal, indicate number which, added to 5, gives desired number from 6 through 9. A clenched fist indicates zero.	Numerals, as indicated.	A nod of the head (I understand). To verify numerals, addressee repeats. If originator nods, interpretation is correct. If originator repeats numerals, addressee should continue to verify them until they are understood.
8. Arms bent across forehead, weeping.	I am in trouble; followed by landing signal indicates forced landing.	Carry out squadron doctrine of escort for disabled planes.

Flight Signals Between Aircraft

II: Takeoff, Formation, Breakup, Landing

SIGNAL	MEANING	RESPONSE
1. Section takeoff leader raises arm overhead, and waits for response from wingman.	I have completed my takeoff checklist and am, in all respects, ready for takeoff.	Wingman raises arm overhead indicating check list complete and ready, in all respects, for takeoff. Then, lowers arm and stands by for immediate section takeoff.
2. Section takeoff leader lowers arm.	Takeoff path is clear; I am commencing takeoff.	Wingman executes section takeoff.
3. Open hand held vertically and moved forward or backward.	Adjust wing position forward or aft.	Wingman moves in direction indicated.
4. Open hand held horizontally and moved slowly up or down.	Adjust wing position up or down.	Wingman moves up or down as indicated.
5. Open hand used as if beckoning inboard or pushing outboard.	Adjust wing position laterally toward or away from leader.	Wingman moves in direction indicated.
6. Hand opened flat and palm down, simulating dive or climb.	I am going to dive or climb.	Prepare to execute.
7. Hand moved horizontally over crash pad above instrument panel.	Leveling off.	Execute.
8. Thumb waved backward over the shoulder.	Take cruising formation.	Execute.
9. Head moved backward.	Slow down.	Execute.
10. Head moved forward.	Speed up.	Execute.
11. Head moved right or left.	I am turning right or left.	Prepare to execute.
12. Hit closed fist against side of canopy.	In/Out of afterburner.	Repeat signal and execute on head nod.
13. Leader pats self on head, points to wingman.	Leader shifting lead to wingman.	Wingman pats head and assumes lead.
14. Leader pats self on head, points to wingman and holds up two or more fingers.	Leader shifting lead to division designated by numerals.	Wingman relays signal; division leader designated assumes lead.
15. Leader shines flashlight on hardhat, then shines light on wingman.	Wingman takes the lead.	Wingman shines flashlight at leader, then on his hardhat. Turns external lights to DIM and STEADY and assumes lead.
16. Any pilot blows kiss.	I am leaving formation.	Nod (I understand).
17. Leader blows kiss and points to aircraft.	Aircraft pointed out leave formation.	Execute.
18. Leader beckons wing plane, then points to eye, then to vessel or object.	Directs plane to investigate object or vessel.	Wingman indicated blows kiss and executes.
19. Division leader holds up two fingers preparatory to breaking off.	Section breaking off.	Wingman relays signal.
20. Leader shakes wings and elevators by rotary motion of stick.	Break up.	Repeat signal and execute.
21. Landing motion with open hand: a. Pats head. b. Points to another aircraft.	Refers to landing of aircraft, generally used in conjunction with another signal. a. I am landing. b. Directs indicated aircraft to land.	a. Execute b. Execute
22. Flashing external lights.	a. Join or break up, as appropriate. b. On GCA/CCA final: leader has runway/ship in sight.	a. Comply. b. Wingman repeats, indicating runway/ship in sight. Ship: leader waves off, wingman lands. Field: When runway conditions preclude a safe section landing, leader will wave off.

Continued

degree left descending turn was initiated into the break with the unobserved wingman in close parade. Approaching the ship's wake at the 45-degree position, the leader leveled his wings smartly to look for other incoming traffic. The wingman was caught by the sudden maneuver, and being unable to match wings, pulled up and to the right. Upon seeing the other plane alarmingly close the leader banked to the left and applied bottom rudder. The dual effort was not quick enough because the leader's starboard wing raked the underside of the other's port wing. Fortunately, both aircraft could maintain level flight. Subsequent safe landings were made with no further difficulty.

Know The Wingman's Location

A good example of close proximity formation collisions involves a flight of four A-6A airplanes. The flight was briefed to practice air-to-air refueling and CCAs. After launch, the prebriefed individual refueling practice was cancelled due to the nonavailability of a tanker aircraft. The flight leader radioed for a join-up. Pilot X (the second section leader) initially joined on his wingman, Pilot Y, and then they quickly switched the lead. Pilot Y then took a position on Pilot X's right side. Pilot X expected to see his wingman on his left and a glance back in that direction revealed nothing.

Immediately thereafter, the section leader extended his wing and fuselage speed brakes. (The A-6A has two sets of speed brakes—wingtip and fuselage—which actuate separately.) This sudden deceleration took Pilot Y by surprise. He whacked his throttles to idle and extended only his wingtip speed brakes. This seemed insufficient to avoid a collision so Pilot Y pulled up and rolled to the left hoping to get over his leader. Both aircraft collided back to back and almost immediately began to disintegrate.

All four crewmen ejected successfully. Three of them were rescued from the water while a fourth was never found. The missing man was seen parachuting into the water and it is possible that he was injured during the collision or ejection process.

Hand signals, due to the pilot's relative position in the cockpit, do not lend themselves to the A-6A. Both the A-6 and A-4 accidents are obvious cases of poor headwork on the part of the lead pilot and equally poor wingmanship.

Night Formation Has Added Responsibilities

Nighttime collisions follow the same general pattern as daytime formation midair collisions with added hazards induced by the physiology of the human eye.

A perfect illustration of the nocturnal tag game also involved two A-4s. These *Skyhawks* were on a practice night, low level, radar navigation flight. The plan was for the student to lead the round-robin until they were back in sight of home base when he was to join up on the instructor. It was a so-called VFR night except for hazy visibility of 4 to 5 miles. The flight was routine until they passed the final radar check point about 20 miles from destination. At that time, the instructor pilot felt that the deteriorating visibility necessitated his assumption of the lead sooner than planned. On the last leg of the circuit, the instructor had been flying wide to the starboard side. It must be assumed that the student observed the running lights. After crossing over to about a mile on the port side, the instructor radioed his position to the other A-4 and asked for verification of sighting. Upon receiving an affirmative acknowledgment, the instructor further stated that he was assuming the lead.

Another affirmative message was transmitted by the student who then proceeded to ease in on the other plane's lights. At such distances, lights alone leave a lot to be desired in depth perception for even the best of young eyeballs. The leader observed what appeared to be a smooth join-up 50′ out at the usual 45-degree angle aft on the starboard side. At this time, the leader relaxed to perform some cockpit checks.

Although the leader thought the wingman was glued to his right wing, the student exercised poor speed control and slid, unnoticed, under the leader and forward under his port wing. You guessed it, an airborne crunch disturbed the cool night air. As an explanation for the slippery join-up, the wingman later stated that he had experienced short periods of vertigo throughout the flight and that one such spell prevented him from retaining his initial good join-up position.

After the crunch, the affair resulted in considerable aircraft damage, but fortunately, both pilots were able to get back home safely.

The experts say that midair collisions are the easiest of all types of accidents to prevent. The Training Command has come up with four good anti-collision proverbs, which bear repeating and a PASEP to all hands:

(1) Maintain a visual lookout at all times when visibility permits.

(2) Do not operate in reduced visibility except under positive control.

(3) Know and use standard formation procedures and signals.

(4) Keep alert.

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On the Glide Slope

1. Question: A TC-45J pilot desires to fly from the Alturas, California Municipal Airport, in instrument conditions, to NAS Alameda. No facilities, other than telephone, are available for filing flight plans at Alturas and the field is located in uncontrolled airspace. May the pilot conduct this flight, and if so, what procedure is necessary to file the flight plan and obtain an IFR clearance?

Answer: Yes, the flight may be conducted in IFR conditions, provided the following conditions are met:

1. The pilot files an IFR flight plan with the nearest FAA Flight Service Station, including a weather brief, by telephone.
2. An IFR clearance is received from ATC prior to entering controlled airspace.

Reference: OpNavInst 3710.7C pp. 514, 561; IFR Enroute Supplement—Procedures Section.

OpNavInst 3710.7C pp. 514c states in brief that prior to flight from a civil airfield with no communications link to a Flight Service Agency, other than by commercial telephone, the pilot shall prepare a DD-175 form or an appropriate FAA form and deposit that form with an appropriate person at the airfield. He shall file his flight plan either by telephone or by radio as soon as possible after takeoff, as the circumstances dictate.

The Procedures Section of the IFR Enroute Supplement describes the procedure for flights departing "P" fields. Where no other communications link is provided to FAA Flight Service, a collect telephone call may be made to the nearest facility. An ARTC clearance is necessary prior to takeoff, only when the field is located within a control zone or area and is under IFR conditions. The Alturas Municipal Airport is located in uncontrolled airspace and an ARTC clearance need not be obtained prior to takeoff.

2. Question: A P3 pilot desires to file IFR from NAS Moffet to NAS Whidbey Island as destination, using a PAR final to runway 06 (minimums 100′ x ¼). Based on an ETA of 1110P, the following sequence report and terminal forecast are in effect:

0800 NUW E4 ⊕ 1R-F 130/40/39 0500 992 VISLWR W
NUW 1332Z 0600-1800 Thurs

NUW C5 ⊕ 1RF OCNLY 3 X ½R + 0900P 3 ⊕ 1RF 1000 WX ⅛F 1300P WX ½RF 1500P + 2 ⊕ ½RF

May the P-3 pilot file on IFR flight plan to NAS Whidbey Island with an ETA of 1110P, in accordance with OpNavInst 3710.7C? If so, under what conditions?

Answer: The pilot may not file IFR into NAS Whidbey Island with an 1110P ETA unless a suitable alternate is available with forecast weather of at least 5000′ ceiling and 5 miles visibility for the ETA plus 2 hours. On an IFR flight plan, destination weather is based on a forecast, (when available) covering the ETA plus 2 hours. The terminal forecast for Whidbey Island, during the period of 1110P, is ceiling indefinite, visibility ⅛ mile in fog, which is below the published GCA minimums of 100′ x ¼.

Reference: OpNavInst 3710.7C p. 561d.

3. Question: An A-4B pilot has filed an IFR flight plan from NAS New York to Bunker Hill AFB via direct ARD, J64 RWA, direct Romney IAF (Initial approach fix), FL 310, requesting a radar departure to ARD.

Clearance delivery issues the following clearance: ATC clears Navy—to the Fort Worth vortac, via direct Yardly, flight planned route. Climb to and maintain FL 190, right turn after takeoff to a heading 170° for radar vector to Yardly. Contact Kennedy departure control 269.0 Squawk mode 3 code 2000 prior to takeoff roll.

Is this a complete and acceptable IFR clearance?

Answer: Yes, with the clearance limit Fort Wayne vortac, this becomes a short range clearance on the filed route of flight. It is a complete and accurate clearance. If no further clearance is received at least five minutes before reaching the clearance limit, the A-4 pilot must enter holding at the clearance limit and contact ATC. If lost communications are experienced prior to reaching the clearance limit, he must proceed via filed route of flight to destination at last assigned altitude or minimum enroute altitude whichever is higher.

Reference: Section II FLIP Planning Document— Pilot Procedures Section.

If you have any questions regarding instrument flight procedures, send them to:

Commanding Officer
VA-127
NAS Lemoore, Calif. 93245

ten DOLLAR word million dollar PROBLEM

by LCDR D. R. Raunig,

Safety Officer, ComFairWingsLant Staff

Webster's Dictionary has a word for it, "SYMBIOSIS." *Sym'bi-o'-sis.* The living together in intimate association of two dissimilar objects where the association is advantageous or necessary to one (the pilot)...and not harmful to either.

The presence of and relationship between the altitude measuring equipment and the pilot within the confines of the cockpit illustrate this word quite well. You'll find a pressure altimeter face on the panel of every airplane you ever strap to your posterior. You'll get so accustomed to its friendly face that you will probably never think twice about what its inner workings and hidden mechanisms are trying to show you. The unhappy fact is that too many pilots place blind confidence in this instrument, never realizing that it is part of the carefully designed system which measures *pressure* and which *can* and *does* give erroneous indications of altitude under certain environmental conditions. More important, it *can* and often *is* misread at critical times during flight. The troublesome factor is that the pilot is one of the principal elements in this pseudo-symbiotic arrangement.

A review of the mass of available accident statistics confirms the impression that the altimeter is often involved in accidents. In all fairness, it is necessary to point out that the pressure altimeter is one of the most accurate, reliable instruments in the cockpit, requiring little maintenance and few replacements: It is a highly accurate, reliable means for measuring *pressure* but must give readouts in terms of *altitude* in feet to be usable in an aircraft. Interpreting these readouts in the cockpit environment has plagued pilots since Wilbur and Orville departed Kitty Hawk. Human factors engineers are trying to do something about what most pilots have known since leaving the training command: that many cockpit equipments are not optimally designed for all pilots to operate and interpret. The pressure altimeter is but one example where misinterpretation can contribute to an aircraft disaster.

Reading Altimeters

The standard altimeter is *not* an easy instrument to read. The importance of quick, accurate reading did not impress the low and slow, VFR, day-only pilot of yesteryear. Nowadays, however, high speed and all weather, day and night operations offer fine opportunities for a pilot, distracted by the tactical problem or other matters, to lose track of his climb or descent and come up with an incorrect reading. Accident and incident records suggest that this has happened on occasion, perhaps more often than can be proven. An erroneous altimeter interpretation can most assuredly terminate a promising career. In ASW patrol operations as well as in other low altitude work, a continuous knowledge of true altitude above the surface or ground is vital to survival.

Measurement of the altitude of the aircraft is one

matter, but how to display this information optimally presents difficulties for design engineers. Unfortunately, aircraft flight instruments cannot really be "read" by the pilot but rather must be *scanned*. Altitude indication scanning must be coupled with scanning of aircraft attitude, power settings, air speed, rate of climb or descent, angle of attack and the flight problem or mission in progress. In considering altitude presentation, human behavior patterns and habits must be included in the design specifications. The optimum instrument for one pilot might be unsatisfactory for another. At best, the instruments we have and their placement in the cockpit are necessary compromises. The answer to misreading is not to do away with the present arrangement but rather to understand what we have and how to avoid the pitfalls. Complete symbiosis in the cockpit is unlikely; awareness of the hazards is the logical approach to follow.

Altimeter Adjustments

Pressure altimetry is a field of science by itself. The specialized areas of this field that interest the pilot involve three sub-areas:

(a) The landing phase of flight.

(b) Vertical separation of aircraft.

(c) Terrain clearance or absolute altitude above the surface.

Each of these flight sub-areas involves meteorological effects. Some of the effects result from the fact that the aneroid (pressure) altimeter is calibrated in accordance with standard atmosphere (29.92" Hg, +15°C at sea level). Actual conditions seldom meet standard conditions. Altimeters are corrected for actual atmospheric pressure prior to takeoff, as a part of the checkoff list. Adjustments are routinely made in low altitude flight

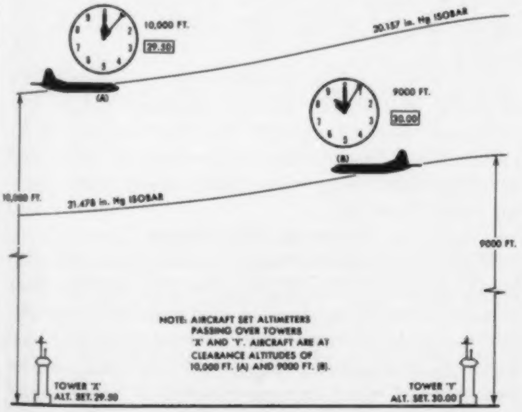


FIGURE a (NOT TO SCALE)

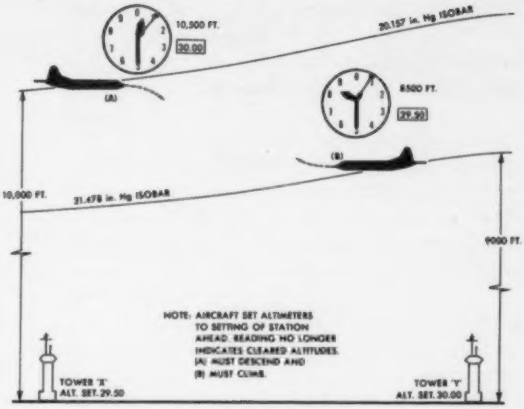


FIGURE b (NOT TO SCALE)

between stations while under IFR. However, there are circumstances, depending on terrain, temperature and wind, which hamper the attainment of the desired compensation results. Errors are also unknowingly entered when these conditions are not realized by maintenance personnel. Maintenance and pilot introduced altimeter corrections are often neglected as unimportant. A rational look at these errors will illustrate the fallacy of this approach.

Altimeters should be adjusted in a sheltered area using the latest barometric readings and local elevation. Tower observations, made at least every hour, are generally accurate with 0.02" of mercury (equal to 20' of altitude); however, errors of .03 to .04" are not uncommon. The local elevation at the aircraft could easily vary as much as 50' from the tower elevation or field elevation shown on approach plates. Additionally, the plane might be parked in a position or in an area where the wind could create a local pressure higher or lower than the tower reading. Cumulative errors of 0.10" mercury (100') can easily result by maintenance performed under these conditions. In a similar manner, a pilot could easily calculate an altimeter error on his preflight checks by taking these same items into account when setting his altimeter. Note here that an altimeter has a plus correction when it indicates a higher setting than the local altimeter when adjusted to read the plane's elevation. That is, the error value must be *added* to the local altimeter setting to obtain a correct reading. Maintenance personnel and pilots must understand this interpretation *to prevent doubling the error* reported. Setting and correction errors become critical during instrument approaches and low altitude flying.

Continued

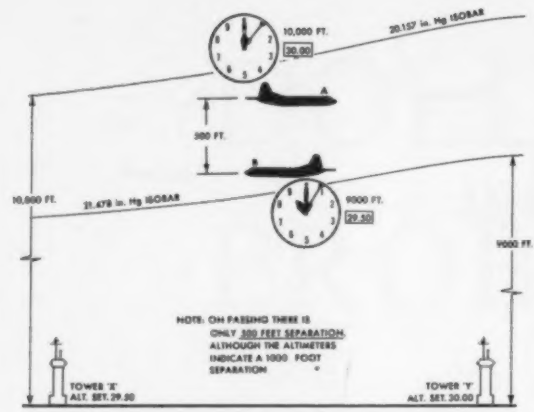


FIGURE c (NOT TO SCALE)

Temperature Deviations

The effects of temperature deviations from standard conditions are seldom considered by the pilot but can be significant in realizing terrain clearance in mountainous areas. Since a fall in temperature below the standard causes a compressive rise in pressure, while an increase in temperature above standard causes an expansion, it follows that when the temperature is below standard, the actual separation between these pressure levels is reduced to less than standard. During winter, the ratio factor of *actual* mean temperature to standard mean temperature is normally about 0.9° and drops to a low as 0.8° or 0.75° over parts of Canada, Alsaka, and northern United States. Figure d illustrates the possible consequences of this phenomenon. Vertical clearances

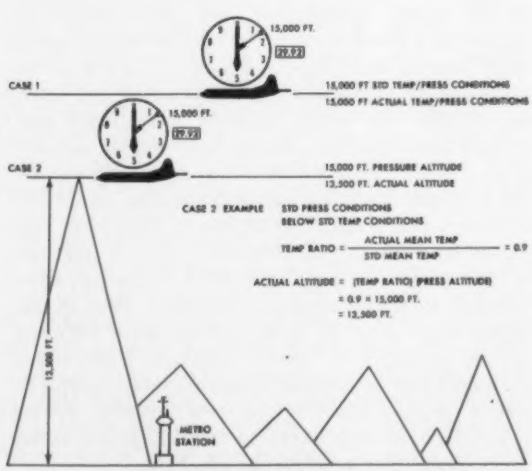


FIGURE d (NOT TO SCALE)

must take temperature into consideration when the altimeter setting is derived at a low elevation such as at the base of a mountain. Substandard temperatures always result in errors that are obviously on the dangerous side. Temperature errors in the northern cold regions can easily exceed 1000′ where pressure readings are taken in valleys at the base of a mountain. Most meteorological stations in the Rocky Mountain states are located in such low valley areas. Care should be taken in flight planning through these areas.

You have seen that your altimeter *can* give you erroneous readings of altitudes. This is to be expected since the pressure altimeter is but an aneroid barometer with readings converted to a scaled reading in feet. Accurate? Yes. Your altimeter can and should indicate differences no more than the distance from work bench to the floor if the deviations from standard are known and correctly applied. Average altimetry system errors, combining system pressure errors, scale error calibration, hysteresis, repeatability of scale error, stability of scale error, temperature of instrument error and others, are less than ±70′ in the zero to 40,000′ standard condition range. These averages apply to properly calibrated systems! Naval aircraft can and should meet this limit. Unfortunately this is probably not always the case.

If the pilots and maintenance men know the procedures, apply the corrections, and realize the inherent deficiencies of the pressure method of altitude measurement, what, then, can be attributed to the accidents and incidents involving the pressure altimeters? The answer reverts back to the design specifications of the homo sapiens flying the aircraft. Man is considerably more complex and far less understood than the black boxes with which he is linked. Instrument errors are *usually* not large nor are they of the type that *normally* cause the accidents.

Each new airplane promises an easy-to-read set of flight instruments. Each instrument design improvement hopes to rectify the shortcomings of its predecessor. The altimeter presentations developed over the years show that these efforts have been somewhat in vain.

Types of Altimeters

There are presently three standard pressure altimeters used in Navy aircraft. The first and the most common is the *Three Pointer* altimeter. This presentation has three concentrically mounted pointers coded in length and shape. The second and more recent presentation seen in naval aircraft is the *Counter Pointer* altimeter. A counter, which is similar to the odometer in your automobile, indicates altitude in

1000′ increments. A single pointer indicates feet in increments of 50′ presented around a fixed circular scale. The pointer makes one complete revolution per 1000′ of altitude changes. As the pointer passes through the 900′ to 1000′ position, the counter moves. The third altimeter is the *Counter Drum Pointer*. This presentation is essentially the same as the *Counter Pointer* type with the addition of a third digit drum in the counter readout window. This third drum rotates simultaneously with the 100′ pointer.

Several manufacturers are working on a vertical "thermometer" type presentation where altitude is indicated by a moving vertical tape against a fixed background. While this presentation is still in the development stage for most naval aircraft, it is being used in some Air Force planes and may show promise in eliminating much of the human factor in interpretation of altitude indication.

Unfortunately, safety records do not yet confirm nor deny that one presentation is significantly better than another. At this point it must be made clear that the *Counter Pointer* presentation can be misread in the 900′ to 1000′ change over range. This problem range was not significantly rectified by the third drum on the *Counter Drum Pointer* type. Since much of the ASW and patrol mission is performed in this flight region the *Three Pointer* altimeter is favored for patrol and ASW aircraft.

Misreading of the *Three Pointer* altimeter is still causing flight accidents and incidents in both jet, reciprocating and turboprop aircraft. While most misreading errors result by mistaking the indicated altitude by 10,000′, there are also frequent cases of misreading errors of 1000′.

There will probably always be some pilots who will misread their instruments no matter what design is used or what inputs are inserted. The cure to this ailment is not sure-fire but the treatment is guaranteed to better your chances for longevity. The remedy is simple: reduce the variables and provide for backup.

1. In multiplace aircraft, have the copilot back up the pilot by calling out each 5000′ level during descent.
2. Check both/all altimeters in flight against each other, particularly prior to starting any descent.
3. If your scan is interrupted during descent, take particular care in noting your altitude when you resume the scan.
4. Make full use of the navigator or other crewmen during descents. His altimeter should be set to the best known setting available in the cockpit.
5. Note the radar altimeter reading during descent. Insure the pressure altimeter matches the absolute radar altitude readout when over water. If a significant difference exists, believe the lowest indication and take appropriate steps to extricate yourself from impending oblivion. Resolve the discrepancy before continuing a descent in instrument conditions or during darkness without exterior assistance such as glide slope information.
6. Make careful note of predicted altimeter settings for your operating area or along your flight path. Whenever possible or practical, obtain the approximate altimeter setting for your area by matching the radar and pressure readings. Compare these with predictions.
7. Be meticulous in maintaining assigned IFR clearance altitudes, making full use of QNH readings when applicable. Figures b and c illustrate these points.

Adherence to these principles does not guarantee success but it will go a long way toward relieving the complacency syndrome and unmeasurable human error symptoms. Until complete symbiosis in the cockpit is achieved, knowledge of the limitations of your equipment and awareness of the hazards should measurably add to your safety and to the success of your assigned mission.

LCDR David R. RAUNIG, is currently assigned to the staff, Commander Fleet Air Wings, U. S. Atlantic Fleet (ComFAirWingsLant) as Flight and Safety Officer. Prior to his present assignment, he was attached to Patrol Squadron FORTY-FOUR at NAS Patuxent. Previous duty assignments include Patrol Squadron FORTY-SEVEN flying the P5M-2, U. S. Naval Postgraduate School in the Weapons Systems Engineering curriculum, and a tour at Naval Air Test Center, Patuxent River where he served as ASW Test and Projects Officer. He was the NATC, Weapons Systems Test Division Project Officer for the evaluation and final B. I. S. acceptance trials of the P-3.

How well are

This vivid personal survival experience was adapted from a $1\frac{1}{2}$ hour safety address recently delivered by General Spruance to members of the Naval Aviation Safety Center and several other commands in the Norfolk area.

General Spruance began his military career flying transports over the Hump during World War II. After the war he continued to fly multi-engine aircraft for many years until his Air National Guard unit transitioned to jet fighters. Then, in order to get a feel for jet operations, he began to travel in a T-33. After a number of uneventful flights, one midsummer trip ended with the accident which forms the basis for this article.

His matter-of-fact style of narration belies the raw courage and determination that sustained him in the months that followed the crash. Since his recovery, General Spruance has used his experience to provide pilots and flight crew members with an incentive to observe the safety precautions that they all too often disregard in the heat of combat or the humdrum air of everyday operations.

During the past several years he has addressed thousands of officers and enlisted men in all the branches of the service. The general's exceptionally strong will to live and his personal ambition dedicated to helping others survive, combine to make his appearance a moving experience.

This is his story.

THE PURPOSE of my standing here before you today is to tell you about my experiences in a near-fatal crash in a T-33 about four years ago when returning from Colorado Springs. If you are interested in a few clues on how to outwit the Grim Reaper, pay attention—but if not, and you don't give a damn, just go to sleep and you can stay out of the office for an hour or so. I will try not to disturb you by talking too loud.

Colonel Snapper McCallister was flying the aircraft—I'm not a T-bird pilot. I'm a 4-engine jock. I figured that when I started flying the *Gooney Bird* that I was taking a maximum risk going from four engines to two and I wasn't about to go back to one, so I let him drive the machine.

At the time we had a fighter outfit and I was the Chief of Staff and Adjutant General for Air. I figured that I should know what makes fighter pilots tick. A lot of it has rubbed off on me from McCallister, and I sorta have an idea of how you people operate. Mac was a pretty darn smart pilot—one of the dive and zoom types who made the change to the all-weather professional jocks which you guys are today. If I had my life to live over, I would certainly have selected him as a pilot to go any place at anytime.

Back to the flight. We were scheduled to get off the ground fairly early for our return to Delaware by way of Scott. It was one of those days in which we should have stayed in bed. Mac was late getting out to the field with some excuse about running out of gas. I was careful not to chew him out because I am not one of those generals who believes in going around raising hell with an airplane driver. You get them shook up, they're apt to kill you if you don't watch it. So I'm real friendly with them and wait to chew them out after we get home.

We got off late and leaped out of Peterson for Scott. We got the flaps up, and fuel started streaming out of the right main wing tank. We aborted, came back to Pete, and had a little discussion with the transient alert types.

They topped us off, and back in the air we headed for Scott. We arrived without incident, except by now it was a dark, hot, muggy night. Those of you who have spent any time in the St. Louis area in midsummer know how miserable it can be. Well, I took my jacket off before takeoff on the next leg. This is where I made my first mistake. I was hot and sweating and didn't want to catch cold when I got to altitude. If I had kept the jacket on, it would have provided insulation from the fire that I was to be caught in in a few minutes. It would have greatly minimized the burns on my arm—so that was my first mistake.

We started taxiing out, and of

e you prepared?

By BRIG GEN William W. Spruance, Delaware Air National Guard

course went through the regular procedures on the checklist. Now, when I'm riding shotgun on a T-33, the seat belt and shoulder harness check means more than just strapped in. I always make sure I don't have anything that will prevent me from putting my feet up on the instrument panel (and I do this in an automobile also) to make sure I can brace myself for an impact. With your legs on the panel, you make a natural g-suit that will help you stay in one piece on a sudden deceleration. Then I stretch and make sure that my hands can reach the panel so I can brace myself with them. And finally, during this check, I put my head back hard against the headrest. I found out later that this was to be my second mistake.

If you are going to impact you should put your head forward with your arms and legs out against the instrument panel. If your head is back, you are going to get a whiplash. This may result in a spine injury or, as in my case, it may tear the helmet off your head. This procedure I've just talked about was a little exercise I used to go through before each takeoff.

Now it is hard for me to get into a mental attitude to think that something is going to go wrong. I think this is one of the hardest things for anyone who really loves to fly to do. One way to help you make this mental adjustment is to read some of these horror publications, i.e., some of the flying safety magazines. You really have got to think about the possibility of pranging sometime and get prepared for it. Believe me, it sure pays off.

Of course we checked pins, lanyard and canopy. I rechecked my chinstrap—tight, and since I wasn't going to make the takeoff, ran the seat all the way to the bottom. I always figured if we were to flip over for some reason, I didn't want my head sticking up there like a goose and get smashed in. My last check was my gloves all the way up, and we took the runway.

Down the runway we went and off into the black night. About the time we got the gear up and the flaps were coming up, the engine quit. No snap, no crackle, no pop, no nothing. It just completely unwound to zero.

Mac comes over the interphone and says, "Boy, we're in a helluva fix; we've got to get out of this." This did not mean to me to eject. We had covered the procedures and terminology that we would use in event of an ejection and this wasn't it. We were at about 150 feet in the air, going pretty slow, and going downhill. Within seconds we hit the first tree, 110 feet above the ground. I had a chance to go through my procedures again—checking the chinstrap, visor down, seat belt and shoulder harness as tight as possible and real uncomfortable.

I braced myself as soon as I heard the first "whap" on the bottom of the fuselage. The next thing that happened was everything went red. At first I thought of fire. Later I found out it was nothing but a red-out when my head was snapped forward. There was a deceleration force estimated between 9 and 13 G. My helmet went right off my head in spite of the fact that it was well adjusted and on tight. The plexiglass of the canopy just fractured and came completely out of the frame. My helmet was actually outside the cockpit.

The seat belt and shoulder harness kept me tight in the seat. If you guys don't have seat belts in your cars, there isn't much I can say for you. Anybody who doesn't have a seat belt and wear it all the time, in my estimation, is an idiot. When I get in a car which doesn't have a seat belt in it, I sit behind the driver. When the guy says, "What are you doing back there?" I say, "When you go through the windshield, I want you to make a good clean hole so that when I go through, I won't get cut." Why, if my kids get in the car with the door shut and no seat belts on, it costs them a buck. Not tomorrow, but right now. They either get out of the car and get a buck or they have to work it off. I charge them a buck on the spot and it really pays off.

Back to the auger. Just before I lost sight because of the red-out, I

looked at the instrument panel and saw 125 knots on the airspeed indicator. All became red and I passed out. When I started to come to, the first sensation I had was a feeling of warmth. I felt like everything was great, a sense of well-being. It was the kind of sensation that you get in the pressure chamber when you take your mask off. That's the feeling I had, and from my pressure chamber training, this was a danger sign that something was wrong.

The next thing I thought of was I had to get out of here, or I wouldn't get back to any cocktail hours with my wife and kids. When I was in General Patton's Second Armored Division early in the war, one of the things that he trained us to do was that when you are in a bind or any kind of shock situation, do something—even though it may be wrong. The chances of your doing something wrong and having it actually hurt you are a helluva lot less than the chances are if you just sit there, freeze in terror, and do nothing.

So I was motivated to do something right away. I was trained to be able to react automatically, because I had gone over in my mind many times what needed to be done in any situation. In spite of the fact that when I woke up with this warm sensation, and completely on fire (there was a mass of flames all around me and I could hear my hair burning on my head just like a crackling grass fire—looking down both sides of the cockpit was like looking into two afterburners), I reached down into one of these ABs to put the pins in the seat.

About then my logic took over and said, Jeez, what the blazes am I doing fooling with these things when those dynamite caps are going to cook off and launch me into the boondocks within seconds. I started to undo my seat belt, and my hands were so badly burned that I permanently injured my little finger trying to take hold of the metal. But still according to standard procedure, though I was burning like a torch, I was just as careful as I could be about getting out of the seat without those pins in place. And I remember taking the chute with me so that I could use the canopy to wrap up in and put the fire out.

So I got up with the chute hanging onto me and looked around. On the left side I could see nothing but a mass of flames, the front and the cockpit were full of fire and I could see McCallister doubled up and completely flat with his head down in the bottom of the cockpit. There was no motion from him. (Later I learned that he had been killed on impact.) Over on the right side I saw a creek and that the water was carrying the fuel off downstream. I turned and sat on the edge of the canopy rail. This was my first sensation of pain. It was so hot that I got a first-degree burn on my tail. I rolled over and sorta half dived and half fell into the water (you just don't execute any point-winning half gainer with a parachute on you and you are on fire). I hit the water and went to the bottom like a rock (we were in about six feet of water).

The next sensation was pain. I reached up and could feel a fair sized hole in the back of my head where it had struck the seat's headrest on the rebound. I came to the surface and began wallowing around doing the butterfly breast stroke to keep the burning fuel on top of the water away from me. I discovered since I didn't have adequate religious connections to walk on top of the water, the next best thing was to walk on the bottom and go uphill. That's the technique I used in this instance and made my way up on the bank.

There I started to pull the T-handle on the chute to dump the canopy. That's the sorriest rig I've ever seen. I didn't have enough strength or mobility left in my fingers to get hold and pull it. The old D-ring would have been no sweat. As it was I wasn't on fire because of that swim I just had, and really didn't need the canopy to roll around in.

While I was yanking at this T-handle and not able to get it out, a bunch of civilians arrived at the scene. I figured that the aircraft might blow up any minute so I began shouting at them to get away from the fire. That's how they found me. They came over and I asked them to get the chute off me. Just try to explain how to take hold of the catch on the leg strap while in a state of shock. You've got one helluva problem. I asked a medic to cut the harness off me. They finally found my knife, cut the chute off, and got me in the ambulance. I started getting cold so they gave me some shots and I don't remember much of the ride. Later I found out that on the way to the hospital the chaplain administered the last rites of the Catholic church. That's probably the reason I survived, because I'm a Presbyterian, and the Catholic rites wouldn't take.

Over the next two years I went through over 30 surgery procedures to get patched up. I'm still not A Number One, but I'm good enough to get my FAA private pilot's ticket. Many things have enabled me to be in the relatively good shape that I'm in today.

First of all I had my gloves on during the crash. Anyone who flies around without gloves in my estimation is another plain idiot. Any of those old wives' tales that they give you about gloves getting soaked with kerosene, crinkled up and are no good, are nonsense. Mine had just about as much JP-4 as

Note unburned area around wrist where overlapping flying suit sleeves and gloves prevented serious injury.

Although the hand and arm look real bad, they were restored to full use through the miracle of modern medicine and treatment.

yours. If I hadn't had those gloves on, I would be a double arm amputee—that is, if I had survived at all. So it really behooves you to wear those things.

Now the reason I wore gloves was that one time down in Savannah our outfit was flying F-86s. One of our young second johns taxied down the ramp, middle of summer and hotter than the hinges of hell, with his sleeves rolled up, elbows on the canopy rail, and no gloves. General Millikin remarks to me, "Well, I don't usually beef at other people's troops, but this guy needs to learn." So this second john gets out of the cockpit and the general approaches him with a story about when he was in the RAF. He related that when they brought back the first casualties of the Battle of Britain they showed the stumps of the arms of guys who had been burned and were not wearing gloves. They showed the legs and stumps of those who had not been wearing boots. From then on he started wearing gloves and expected everyone else to do so.

I was so impressed by this that I started wearing gloves. I hadn't worn gloves all through WW II. I figured gloves were for the wintertime to keep hands warm. I started wearing gloves because of what General Milliken said to this second balloon. This points out the importance of all of us making sure everyone uses his personal equipment and not being afraid to sound off when we see something amiss.

Another aid during the crash was a pair of boots. If I had worn low cuts instead of boots, I would be a double leg amputee. Low cuts in a bailout or any kind of fire situation are a complete waste of time. I had my boots on, and thank God I did. I would have burned off both my legs if it weren't for them.

Finally, I can't say enough for the treatment the Air Force gives at their hospital in San Antonio and the help from the Army burn center. There they have, without doubt, the greatest concentration of knowledge on burns in the whole world. They were able to save my arms and hands after many experts said it couldn't be done.

Then there is always the will to live. When things look real dark, it's easy to throw in the towel and call it quits. But the human body is a remarkable thing that can come back from over the brink and recover. It can and will, if you have the proper mental attitude and the guts to stick it out. The doctors, chaplains, and our medical technologists can perform miracles if you let them. In the final analysis, it's up to you—what you wear, and how well you are prepared.

Reader QUESTIONS

Have you a question? Send it to Headmouse, U. S. Naval Aviation Safety Center, Norfolk, Virginia 23511. He'll do his best to get you and other readers the answer.

Headmouse ANSWERS

Mk-5 Anti-Exposure Suit

Dear Headmouse:

As skipper of a Pacific fleet VS squadron, I thought I would display a bit of "leadership through example" and so I volunteered for the new Deep Water Survival Training Course offered by FAETUPac at (or near) North Island. I must preface my remarks with the observation that the course of instruction, the equipment and the dedicated people giving the course are all 4.0. The realism, learning through doing and thoroughness of the course were outstanding. It should be a must for every air crew member. My big beef is not with this excellent course, however, but rather with the anti-exposure suit.

In our class of 17 persons from all types of squadrons from jets to helos to *Stoofs*, well over half complained of *excessive* leaks in their anti-exposure suits. All had some leaks but over half were major and even in our relatively warm water (57°F.) resulted in impaired abilities after our short three hours in the water. What is more, these were personal suits brought from each man's squadron and supposedly the product of the best fitting, care, stowage and inspection his squadron could give. (For many of us, however, personal fitting was out of the question since there simply are not enough suits to go around. My squadron, for instance, has four pilots and air crewmen my size and only two Mk-5's.)

The leak in my suit was of such severity and location (bottom of the main zipper would not seat) that it filled totally in 30 seconds and remained filled the entire time. Had I not been a strong swimmer, had the water been colder or had I been asked to RON in that raft, I would have been hard put to climb into that helo horse collar.

This is not a new problem. I know that each of the earlier suits and the present Mk-5A have been repeatedly griped as leakers and, hence, worthless to a man in frigid water. Now then, even if he was fortunate enough to draw the only tight suit in the squadron—what are the usual conditions under which he is most likely to need his suit? I can think of three main conditions, all of which are rather traumatic to contemplate: ditching, bailout and crash. The possibility, of a rip or tear in any of these situation is extremely great. Apply this likelihood of a rip to the less than 50% watertight suits in any given batch and you can see the slim chance of having a warm wait for the helo.

I had the good fortune to participate in the evaluation of a modified, ventilated, one-piece skin diver's wet suit as a possible replacement for existing garments. *This was two years ago.* The study was quite wide and very thoroughly written. Its conclusions were clear and well documented. Its forwarding endorsements were almost as enthusiastic as the report. *Just what is it that takes so darn long to decide?*

As a result of today's drill I'm quite convinced that there is a need for an anti-exposure garment but I'm totally unconvinced that the Mk-5A is the answer.

WET AND COLD MOUSE

▶ Your letter was forwarded to the Naval Air Systems Command as a matter under their cognizance. Meanwhile, another Pacific Fleet squadron reported the same thing to the Naval Air Systems Command and received the following answer: "Testing of a fully ventilated one piece neoprene foam wet suit has been completed by the Naval Air Engineering Center, Philadelphia. It was concluded that the wet suit would afford protection for one hour in 32°F water and 20°F air temperature with wind speeds up to 20 mph. Action has been initiated to procure 4000 of these suits for fleet introduction in FY-68. Efforts to develop an improved anti-exposure suit are continuing; however, the ventilated wet suit is considered the best available at this time and will be procured to supersede the Mk-5A anti-exposure suit."

Very resp'y,

Headmouse

AF Oxygen Masks

Dear Headmouse:

I have three pilots currently using Air Force oxygen masks instead of A-13A masks in A-4 series aircraft. This mask does not incorporate a laminar seal for proper fit at altitude. For this reason, I am hesitant to use this type mask. Is there any publication or authorization for rigging this mask to the K-4 oxygen system?

RIGGERMOUSE

▶ To the best of our knowledge there is no authority for naval personnel to use this Air Force equipment.

Very resp'y,

Headmouse

Old Murphys

Dear Headmouse:

In reference to your A-4 Ordnance Murphy, page 43 of the May issue—"Old Murphys never die, they just come back to haunt us." See Enclosure (1).

Q. C. NAS OLATHE

▶ The enclosure was a copy of a message to NavAirSysCom dated Dec. 65 citing an A-4B's starboard gun feed mechanism blowing apart during test arming. As reported in the May issue, the 550 psi and 1200 psi pressure regulators had been reversed due to being look-

alikes. Inspection revealed 7 other A-4Bs received from PAR with identical Murphy installation of regulators. Pending some other means of quick identification of these components, color-coding had been recommended.

Although color-coding works most of the time, please turn to page 34 and see "Wha Hoppen?"

Very resp'y,

Headmouse

Helo Ice Problems

Dear Headmouse:

We were scheduled for a section night launch from NAS Blank in two SH-3As. The briefing at 1700 described the weather as 1200′ broken, 1500′ overcast, visibility 10 miles. . . The freezing level was at 3000′ and the forecast showed some rain showers with visibility lowering to 5 miles in precipitation. Both helos took off at 1800 as scheduled. The weather was verified to be about 1200′ broken. Temperature was obtained from tower as 40°F.

Weather was checked three times during the hop. The 2000 local report was 700′ overcast, visibility 1 mile, freezing level was still at 3000′. About 2030 local, the first SH-3A returned home. He encountered windshield ice at 500′. He landed with no apparent engine malfunctions but downed his aircraft for possible ice damage. He attempted to pass the deteriorating weather to me but no message was heard because he was having radio transmitter problems.

I arrived for final landing about 2015 and was given weather as 700′ overcast visibility one mile. I requested and received a special radar approach. While at 500′ indicated altitude, the SH-3A picked up heavy icing on the windshields, windshield wipers, and sponsons.

After a safe landing the aircraft was downed for possible engine damage. Inspection revealed no damage to either power plant. There was, however, a real danger of pieces of ice breaking off and being ingested by the engines. The ice was not forecast. Surface temp was 36° when the ice was picked up at 500′.

Recommendation—Install a *good* ice and FOD deflector on the SH-3A. Have there been any developments on this ice problem?

▶ The best answer to this problem to date was published in the March 67 *Crossfeed*, Part II, pages 1 and 2 of the Helicopter Section.

Very resp'y,

Headmouse

Leadership

Dear Headmouse:

Subject: Wearing of flight suit, anti-buffeting hard hat, flight shoes and gloves while under command of aircraft senior officer. I have observed some senior officers not abiding by the rules that they themselves make all other aviators/crewmembers stick to. The importance of wearing these items cannot be overemphasized to all concerned. How can this be impressed upon young crewmembers if our leaders do not follow what has been taught from the beginning?

ANYMOUSE

▶ We agree with you wholeheartedly: leadership should begin at the top through example. For a better insight on this aspect, please read General Spruance's article beginning on page 18.

Very resp'y,

Headmouse

Would You Believe?

Dear Headmouse:

Regarding the picture "Would You Believe?" page 42 of the May issue showing a flat threadbare tire on ASE, this is the standard answer at almost every station I have been on.

Inspector to Driver: "So what? It doesn't go very fast anyway, besides we don't have enough money for tires."

ABHC V. J. REPACI
LCPO CRASH CREW
NAAS WHITING FIELD

▶ Someone is remiss in his duties and responsibilities if he accepts such an answer and operates the vehicle in an unsafe condition. The example referred to certainly violates every one of these regulations.

NavSo P-2455, Safety Precautions for Shore Activities, para 0511, Operator's Qualifications and Requirements, subpara 3., Inspection and Maintenance of Vehicles states: "Motor vehicles shall be maintained in a safe condition and no operator shall be permitted or required to operate a vehicle known to be unsafe."

NavDocks P-300, Management of Transportation Equipment, para 2.3.1.2. Driver Preventive Maintenance, states: "Drivers are the first line of defense against equipment wear, failure and damage. Defects discovered during inspection or operation of the equipment will be noted on DD Form 1358 and reported as soon as operation has ceased. The driver must stop operation immediately if a deficiency is observed that could damage the equipment or render it unsafe. When inspections are performed by other than the operator (service station or maintenance personnel) it is the operator's responsibility to insure that the required services have been accomplished and the equipment appears to be in safe operating condition."

NavWeps 00-80T-96, Aircraft Support Equipment, concerning support vehicles and the other references cited require inspection of tires for proper inflation, unusual wear, cuts and bruises, or penetration of foreign objects as preoperational checks.

In view of these requirements, it is still hard to believe that in this day and age people are accepting the answer you cite, contrary to regulations.

Very resp'y,

Headmouse

P.S. Chief Repaci states: "We at Whiting Crash do not accept the standard answer because if we down enough vehicles the field would have to cease operations. But I know people who accept such an answer and they deserve all the grief and headaches they get."

Before and After

Good Show, NAS Jax!

A picture story in the November 1966 Approach titled "Are These Conditions Necessary?" depicted a number of hazardous conditions which exist around air stations and indicated that a number of the older installations may not conform to present standards.

To detect and correct such conditions, NAS Jax conducted a careful survey which revealed a number of hazards. In a span of less than five months, most of the hazards have been eliminated, a few will take a little longer. The pictures tell the story.

Planned future surveys will guarantee early discovery and correction of hazardous conditions and all new construction will be monitored to ensure a safe aircraft operating environment.

E-15 Arresting Gear: Before

. . . After: Filled and sloped to grade.

. . . After: All debris removed. Area to be asphalted upo completion of centerline lighting contract.

Manholes: Befo

. . . After: Solid pipes replaced with frangible couplings at ground level.

. . . After: Filled, sloped to grade and paved.

. . . After: Lid set in concrete, filled and sloped to grade.

. . . Fuel interceptor, water pit, and buildings, pending SysCom approval, will be removed, filled and graded.

Introduction

The major lesson to be learned from the following article is one that has been common knowledge to single main rotor helicopter pilots since the birth of rotary wing aviation. But it's also one which many H-3 aviators have overlooked because they tend to count on the highly sophisticated systems in the aircraft to keep them out of trouble. (These include nearly automatic rotor RPM control and the more recently introduced power management system, or PMS.)

The lesson, which hasn't changed with all the new improvements, is that the antitorque rotor is designed to operate only within certain flight envelopes. However, as pointed out by NavAirSysComHq msg 102303Z Feb 67, "It must be realized that the variables of forward, rearward or lateral drift, turn rate, decreasing rotor RPM and increasing altitude adversely affect tail rotor authority. When these conditions exist, consideration must be given to reducing antitorque requirements imposed on the tail rotor by: (1) reducing collective pitch, and (2) moving into forward flight." Additional details can be found in the following messages, which have been distrubuted to appropriate squadrons. (See NavAvnSafeCen msg 242130Z Feb 67; NavAirSysCom msg 102304Z Mar 67). Strict adherence to NATOPS procedures with regard to exceeding tail rotor authority is the only safe way to avoid misevaluating the circumstances related below as being indicative of tail rotor failure.

The will to survive mentioned by the author is clearly found in aviators who have sound technical knowledge of their aircraft and who understand the effects of environment on satisfactory mission accomplishment. The straightforward type of narrative used by LCDR Weseleskey, is acknowledged to be one of the most effective mishap prevention techniques known to aviation safety. It is hoped that the spirit and information contained in this article and in the message traffic relating to the substance of this mishap, will have positive impact on the ability of H-3 aviators to perform their mission. *LCDR R. R. Rose, ASW Helicopter Anaylst NavAvnSafeCen*

'I will survive!'

by LCDR Allen E. Weseleskey

Naval aviation continually challenges its participants. Carrier pilots have met these many challenges with a great degree of success, and almost all have displayed one common trait well—The Will to Survive. The incident related in this article demonstrates the type of determination that has meant the difference between success and possible failure in many of the unusual emergency situations found throughout the history of naval aviation.

An ASW helicopter pilot's life aboard a CVS is certainly not glamorous. His feelings of accomplishment may not relate directly to the deep satisfaction that a CVA attack or fighter pilot feels after running in on a difficult target and scoring a direct hit. One thing is common to all carrier pilots though, or should be; and that is the will to survive. I would like to pass along a recent experience that deepened my determination to be more than just a throttle jockey and stick man, and renewed my will to survive.

Briefing was a little stuffy in Ready 1. Those darn cigar smokers get to me every time! The assigned mission was tracking an exercise submarine utilizing three destroyers, a couple of S-2s, a *Fudd* and our two SH-3D helicopters. I thought that the exercise itself would be another canned problem but realized that our recent weather and a sea state of five would make the flight a little more challenging.

Our brief was completed under the red lights, and I wondered, "Just how dark would it be out there?"

"Pilots man your planes," came the voice over the bark box from CATCC.

As I stepped onto the flight deck I realized how

black it was. The "red carpet" flood lights illuminated the deck and made the *Stoofs* and helos appear as though they were floating in a void of black velvet.

It was about the blackest night I could recall. The deck was pitching enough to make me want to launch just to find a stable platform to ride on!

The preflight and turnup were uneventful. I rechecked my IFR departure number and had my copilot confirm our altitude assignments. The flight leader lifted his helo in front of me and all but disappeared into the black void. Then I saw his two rotators flash on; he was well on his way.

As we lifted everything checked out fine. I beeped the nose over and started my climbout. The copilot checked in with Departure:

"Control, 58 Kilo."

"Roger 58, vector 280/40 miles for your Freddy. Do you hold 55 ahead?"

"58, affirmative, out."

I leveled out at 500′ about one mile behind my roommate, the flight leader.

"Want to fly it Jerry?"

"Yep, I've got it."

I clapped my hands between us to indicate that he had full control, then relaxed my instrument scan to look outside. If I couldn't have seen the rotators ahead I'd have sworn I was in the Weapons Systems Trainer back in Norfolk and somebody had tarred the windows.

As we neared our assigned destroyer, Control came up.

"55, and flight, your Freddy now 290/5 miles, switch button six, bingo this."

"55 and flight, Roger, switching."

I switched my radio and checked in with 55. Our Freddy was up and waiting. The controller was a squadron mate on cross-polination training. It was reassuring to hear his voice as he vectored us into the datum area. "Tom would be sure to keep us clear of *Stoofs* and DDs," I thought. I completed the predip check list as Jerry set up for the automatic approach to hover. Our final vector into the wind line looked odd—the groundspeed/airspeed/wind resolution didn't look right. I called again for a wind check and my roomate in 55 came back:

"090 degrees looks good from the smoke light I just checked."

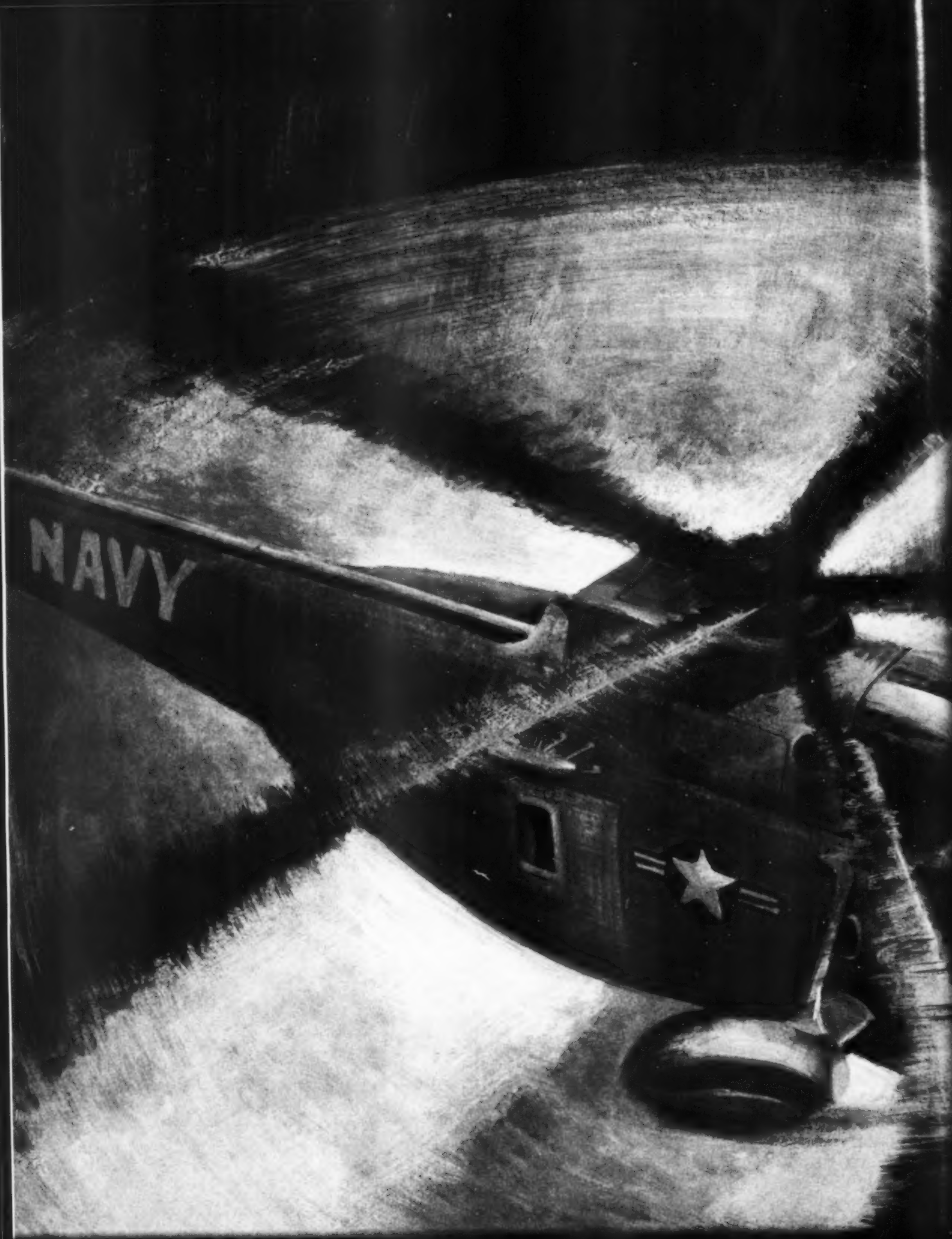
"Stand by for automatic approach," called Jerry on the ICS.

"Switches forward, pots set," I replied.

"55 mark dip," called the controller.

"Coupler," said Jerry.

"Engaged." I noted the green lights come on and rechecked heading, altitude, airspeed, attitude and


NAVY

time. Everything looked fine. The aircraft took a steady 5-degree nose-up attitude and came right down the glide path to a hover. "Just like advertised," I muttered to Jerry.

Then our first indication of difficulty came. The aircraft started to vary from the programmed 40′ hover and the torques on both turbines rose and fell with wide variations from the normal power required to maintain a hover.

As we began to ride the waves I became slightly uncomfortable.

Jerry said, "I'm going to pickle this thing off, it sure isn't stable. Look at those torques."

I saw the torques dropping from 100 percent on the gage as Jerry aborted the hover attempt.

"55 break dip," I called to our Freddy as we climbed to 150′.

"I've got the ship, Jerry."

"OK, you've got it."

"Recheck the pots and let's try that approach one more time. I guess that sea is mean enough to foul us up," I said. I noted on my brief that the seas were forecast to be 180-degrees out of the wind.

I flew straight ahead and ensured that we were well within the envelope for an approach.

"Stand by for an automatic approach."

"Roger, switches forward, pots set," Jerry came back.

"Coupler."

"Engaged."

"Well, it's a smooth ride down," I thought to myself. I was intently scanning the instruments and felt reassured as we entered a stable hover.

"Looks like we were able to hack it. Sonar, check the sonar trial position!"

"Roger, checking trail position," was the reply.

Just about the time the sonar dome started to lower, the aircraft began to vary in altitude as though it were responding to the wave action below. I dampened the collective lever slightly and noted the radar altitude indicator varying between the 50 and 33′ marks. The engines were winding and unwinding as the torques rose and fell with the demands of the integrated hover equipment. The altitude oscillations began to intensify rapidly as the collective pumped up, then down with tremendous force. The altitude variations increased as the torques passed through a normal hover load of 65 to 70 percent. We were indicating 35 percent during the descent and 110 percent in a climb. This was more than I cared to fight. We were in transient overtorque conditions when I saw us drop to 25′ above the waves. This entire evolution had deteriorated in a matter of only a few seconds, and I was more than uncomfortable—I

was darned worried! I rechecked the VGI and released the coupler which had held us in an automatic hover. The torques were already rising above 110 percent as we started to depart. Then something happened and the RMI began to spin wildly to the left. My scan dropped back to the VGI and noted the integral needle/ball indicator confirming that we were in a rapid right turn. Our airspeed was zilch! The symptoms clearly indicated that we had lost tail rotor control or that the tail rotor had separated from the aircraft.

My eyes were now attracted to white churning water below and the reflection of our chin rotator as I applied full left rudder. Procedures called for me to land the helicopter in the water immediately.

The NATOPS resolution to the problem was immediately rejected, as I visualized us making an attempt to squat in the rough seas while doing an uncontrolled 360. We'd be sure to dig a rotor in and break up or at least flip over. The crew wouldn't have much chance to escape if we began to sink immediately.

I made the decision to go up, and up we went. By this time I had long been holding full left rudder without any response from the tail rotor. For one fleeting moment when we were nearest the water I thought we were going in, but I was determined to fly the machine for all I was worth until we did.

I rotated to a nose-up attitude. If we were going to hit I wanted to be darn sure that it was tail first, and not nose first.

Jerry thought he saw the VGI go almost all white. I had at least a 15 to 20-degree nose-up attitude when I felt that reassuring climb take hold. The radar altimeter gave me the clue I was looking for—we were established in a max performance climb. The dual torques read over 125 percent and this was well over the allowed 120 percent transient limit.

We had already passed through the first 360 degree turn and were well on our way into at least the second, or was it the third, when I realized I must broadcast our difficulty. Should we go in at least they'd know why, or what had happened, or what was happening.

"55, we're out of control—we've lost rudder control and are spinning, 55!"

The destroyer controller came back, "Where are you 55, what's your trouble?"

My roommate piped up reassuringly, "That's 58 that's in trouble. We're okay!"

After at least two full turns the RMI slowed and almost seemed to stop. We were at 600′ and I immediately realized we still had a tail rotor on our machine. We stopped spinning momentarily, and I had begun to take out some of the left rudder when we started back into the right spin! Around we went again as I held full left rudder and probably full UP collective pitch! I glanced over and saw that Jerry had his left leg jammed in with me, and his hands were lightly, but reassuringly on the controls with me. The VGI continued to dance, varying in pitch and roll. I fought to maintain a wings-level attitude as we rose like a rapid merry-go-round. I vividly recall little or no sense of motion while we spun. I was so intent on the instruments that vertigo never seemed to be a problem, but I was busy as could be on those controls. I radioed, "Still out of control and climbing." I was sure the *Stoofs* had cleared the area.

Our altitude increased as I caught a glimpse of 090 pass by twice on the RMI. Then we slowed again passing through 1100′. I relaxed the collective slightly, reassured that we had bought some precious

time to analyze the situation. I racked my brain trying to resolve a solution and get the huge *Sea King* straightened out. The thought passed through my mind that we'd never stop spinning when suddenly—we did just that—we stopped!

Almost immediately Jerry shouted, "I've got it, I see a light ahead, I've got it Wes." We were still near zero airspeed.

I released the controls and stared at the compass and VGI. I couldn't believe they were still! I broke into a sweat and watched as Jerry eased the nose over to gain airspeed.

I touched the radio switch.

"58 is on top at 1400′ and under control, under control. We're going into forward flight now, how about a vector to homeplate?"

"Roger 58, your pigeons 100/42 miles. Are you OK?"

"That's affirmative, we're presently turning to 100 degrees, proceeding at 80 kts for immediate landing on arrival. Break—55, are you with us?"

"55, right behind you 58."

"Rog, let me tell you about our little ride just in case we don't make it home, at least you'll have some starting point to work from."

I related the conditions we had encountered to my roommate. Jerry still had the aircraft and held it right on course and airspeed.

It was quiet. A thousand things raced through my mind during those long 42 miles of transit.

The carrier's controller picked us up some 30 miles out and set up our CCA. At 10 miles out I took control again.

"I've got it, Jerry."

"Rog, you've got it, I'll get the check list."

"Tell the tower we want a minimum deck crew out, no telling what's going to happen when we try to land this thing."

Jerry completed the call—After what seemed to be an eternity we approached the rounddown and I rolled the *Sea King* onto the deck.

"Thank God we made it," sighed Jerry.

As I rose to leave the cockpit after shutdown Jerry said:

"Wes, I don't know how the hell we didn't get inverted or how we missed taking a cold salt water bath—it's a miracle."

I thought a second and recalled the advice of a former boss:

"When in danger and during any emergency, fly that aircraft for all you're worth every moment you are at the controls . . . Far too many pilots have given up and bought the farm when a little more technique, drive, ability or just plain old will to survive would have pulled them through the situation at hand."

He was right. I have taken his advice and continually applied it both in the office and in the air. That positive attitude has been a keynote for me and I know without a shadow of a doubt that I will survive . . .

Will you?

LCDR Weseleskey became a NavCad in 1955. After advanced training flying the A-1, he was assigned to VAAW-35. He became a Centurian while flying the Taiwan Straits patrol. In 1959 Lt(jg) Weseleskey received helicopter training and assignment to HU-1 flying with utility detachments aboard USS MIDWAY and HANCOCK. A tour with the Air Sea Rescue unit at NAS Agana, Guam, followed where he made two dozen successful rescues and worked with the Bathescaphe Trieste during the Marianas Trench Dive.

In 1961 he became assistant O-inC of the Presidential Heliport at Anacostia. In 1963 he was ordered to USNPGS Monterey; and upon completion of the baccalaureate program in 1965, LCDR Weseleskey was ordered to HS-3. He has recently been assigned to Southeast Asia.

MOONLIGHTING

notes from your flight surgeon

AN AME3 and an AME2 were installing a Martin-Baker ejection seat in the rear cockpit of an F-4B. Both men checked the firing chamber to make sure it was disarmed. The AME2 then left the rear cockpit and went to the front cockpit to check that seat.

The AME3 was to do a functional check on the rear seat which included pulling both the face curtain and alternate ejection handle to assure that the seat would fire if it were armed. He stood on the rear seat and pulled the face curtain. The seat fired, ejecting him and the seat through the open canopy. He survived the ejection but, along with other injuries, suffered a fractured skull, brain concussion and traumatic amputation of his left hand.

Interviews with the injured man revealed that he must have mistakenly installed a primary firing cartridge into the chamber after both men had checked to see that the chamber was clear but before he pulled the functional check. He was still suffering from a partial lapse of memory at the time of the investigation and was not sure this was what happened. However, the report states, "he suspects that he must have gotten ahead of himself and armed the seat before the functional check."

The AME had, for the five months preceding the incident, been "moonlighting" on a service station job: 0900-1500 at the station and 1600-2400 at the squadron.

The fourth endorser was of the opinion that sufficient weight was not accorded in the investigation to the "highly probably adverse effect of (the AME's) dual employment upon his alertness."

"Time frame of evaluation of rest is 48 hours but it has been determined that dual employment had been continuing since . . . he was assigned the 1600-2400 squadron duty," the endorser wrote. "During this period he had been working 14 hours a day: 0900-1500 at the service station and 1600-2400 at the squadron. The interval between 1500 and 1600 was in good part consumed by transit to the naval air station and reporting to the squadron for his assigned duties. It can be assumed, in the absence of verification by (the injured man) that he arose about 0800 to dress, possibly have breakfast, and report to his service station job by 0900. At best he would be to bed and asleep by 0030 giving him a maximum of 7½ hours a day sleep. This would be further reduced by any recreational activity indulged in between the hours of 2400 and 0800.

"The practice of 'moonlighting' of the nature reflected in (this) instance can only be detrimental to alert and responsive reaction," the endorser continues. "Long hours of work, regardless of strenuous nature, coupled with the debilitating climate of this area—sun, heat, humidity—cannot but degrade a man's acuity, such degradation varying in individual cases. It is quite possible that fatigue was contributory to (his) mental lapse in

this accident.

"It is additionally recommended by this endorser that commanding officers be reminded again of their responsibility in monitoring 'moonlighting' activities of their personnel. A narrow rather than a broad attitude must be taken to safeguard the individual's welfare as well as that of those so intimately dependent upon his performance."

No Preflight

A PILOT whose aircraft went over the side after landing aboard ship found himself in the water with a life vest which inflated only partially. The right CO_2 cylinder "fired" but the left did not. After rescue he found that the left CO_2 cylinder was only dented. The cylinder had not been screwed into the cylinder container tightly and consequently was not punctured when the toggle was pulled. *The pilot had failed to preflight his life vest.*

Conditioning

WHEN a UH-34G ditched in a river, the crew swam to shore. One of the crewmen discarded his hard hat on leaving the aircraft because he thought he would be able to swim better without it. The helo rescue up through dense 75-foot-tall trees was described as a difficult operation. The first survivor hoisted up sent his hard hat down on the sling for the bareheaded crewman.

"It would have been to my advantage to have retained my hard hat," the crewman said later. "It was pointed out to me after the accident that a hard hat is capable of buoying up the head and actually aids in water survival. Although in retrospect it seems logical, this was never pointed out to me during any of the survival lectures I attended. All swimming training was done without a hard hat, although at times we did wear flight suits and, I believe, tennis shoes. My hard hat also would have been helpful on the ground when the rescue aircraft was hovering overhead. The visor could have been pulled down to keep blowing debris, sand and trash out of my eyes." (Debris was blowing so much that another crewman reported that "you almost had to have the helmet visor down to open your eyes to find the helicopter hoist.")

A general survival rule, the investigating surgeon pointed out, is to retain and use all your equipment. "This general rule obviously did not impress this man (and I assume many others also) as strongly as did the actual practicing of water survival techniques without a protective helmet."

(Editor's Note: Perhaps it would be a good idea for physiology units to get some surveyed helmets for use in water training. This would help condition pilots and crewmen to retain their helmets in actual survival situations.)

Reducing Pills and EKGs

THREE abnormal electrocardiograms (EKGs) on pilots of other services have been reported in which *none of the men had heart trouble and all of them were taking reducing pills without benefit of flight surgeon*

In one case, the pills had been prescribed by a practitioner for the pilot's wife.

Flight surgeons investigating these cases sought the help of the regional laboratory of the Federal Drug Administration (FDA) to identify the drugs in the pills. The laboratory definitely identified the culprit drug as digitalis leaf. Other drugs identified were basically amphetamine derivatives and less hamful items such as lactose and charcoal.

In one of the three cases, the pilot also had in his possession, in addition to the heart-stimulating reducing pills, six other kinds of nonprescribed pills, one of which was a diuretic. Intensive use of a diuretic can cause loss of chlorides and potassium, a condition which can be extemely hazardous in patients taking digitalis.

- Prescriptions are written by physicians for a particular patient in a particular situation and no one has any business taking another person's medicine.
- Flying and medication—especially medication not controlled by a flight surgeon—do not mix.

Cuts Lanyard

AN F-8E pilot in the water after ejection inadvertently cut away his survival equipment pack because a parachute shroud line had been used to attach it to the seat pack.

The Naval Aviation Safety Center suggests securing personal survival equipment with some kind of flat yellow tape vice shroud line. By daylight the tape can be distinguished from the shroud line by sight. At night it can be distinguished by touch.

E-2A Prop Hazard

WHEN parked, an idling E-2A is a very real safety hazard. The engines, turning at 100% rpm, produce approximately 700 lbs of thrust. To compensate for this the props are placed in a zero or very slightly negative thrust position, which results in no prop blast aft. In addition, the arc of the E-2A prop extends out beyond the wing stub when the wings are folded. All these factors combine to make it extremely easy to be struck by an E-2A prop. ASOs, flight line and flight deck supervisors are advised to get the word out on this and be especially alert for signs of carelessness.

—VS/VAW Crossfeed

To prevent Murphys, we often use the expedient of color codes or stencils. This method works—most of the time—but. . .

WHA'

*If an aircraft part can be installed incorrectly, someone will install it that way!

If a circuit can be color-coded wrong, someone will color-code it wrong.

...'HOPPEN?

Let's say you have six white socks and six black socks in your locker. The ship is in a darkened ship condition. You reach for a pair of socks—how many socks would you have to withdraw before you are assured a matching pair?

Okay, let's try this one:

You have two circuit plugs. Upon disconnection there are four halves—two male and two female; one pair is color-coded red. It's daylight and you have to hook them up—how do you hook them up? —red to red, of course, and wrong!

For instance: When the A-4 pilot on a loft bombing run triggered the centerline station Practice Multiple Bomb Rack to release a single bomb the fully loaded PMBR was ejected from the Aero 7A ejector rack. Murphy's Law prevailed. Normally, when the PMBR is carried, the primary release circuit is connected to the PMBR and the emergency release circuit is connected to the Aero 7A. In this case the circuits were cross-connected causing unintentional salvoing of the PMBR.

To combat Murphy's Law, the primary circuit plug is color-coded red, (Ref. AAB 241) but in this case the *emergency release circuit plug* was color-coded red.

The corollary to Murphy's Law in this instance could read: "If a circuit can be color-coded wrong, someone will color-code it wrong."

After this mishap the reporting squadron directed a functional check of all racks together with primary and emergency stores release circuits to determine whether any of the other birds had improperly marked circuits. Also, because of the requirement for frequent changes in external stores configuration, a functional check of release circuits was ordered each time the external stores configuration is changed. This is a requirement IAW MIM (another case of not using the book and the Ord loading check list).

Another situation involved the installation of a helo's tail rotor blades backwards. The blades were designed so that they could be installed wrong and they were, but discovery was made before turnup. In another case only one blade was put on backwards, and a turnup made which resulted in severe vibration. An immediate shutdown followed with nobody hurt except in their prides (mechanic, inspector, copilot and pilot).

Now it was directed that all SH-3A blades undergoing PAR will be stencilled with the word: "Outboard." This meant the blade's angle-of-attack was to face outboard. You guessed it—somebody stencilled the wrong side of the blade. Again, the corollary of Murphy's Law might read: "If a stencil can be applied on the wrong side, someone will stencil it that way."

NavAirSysCom has since directed a redesign of the blade to preclude backward installation.

Then there's the one involving an SH-3A with high time on its rotor head which required replacement with an overhauled unit.

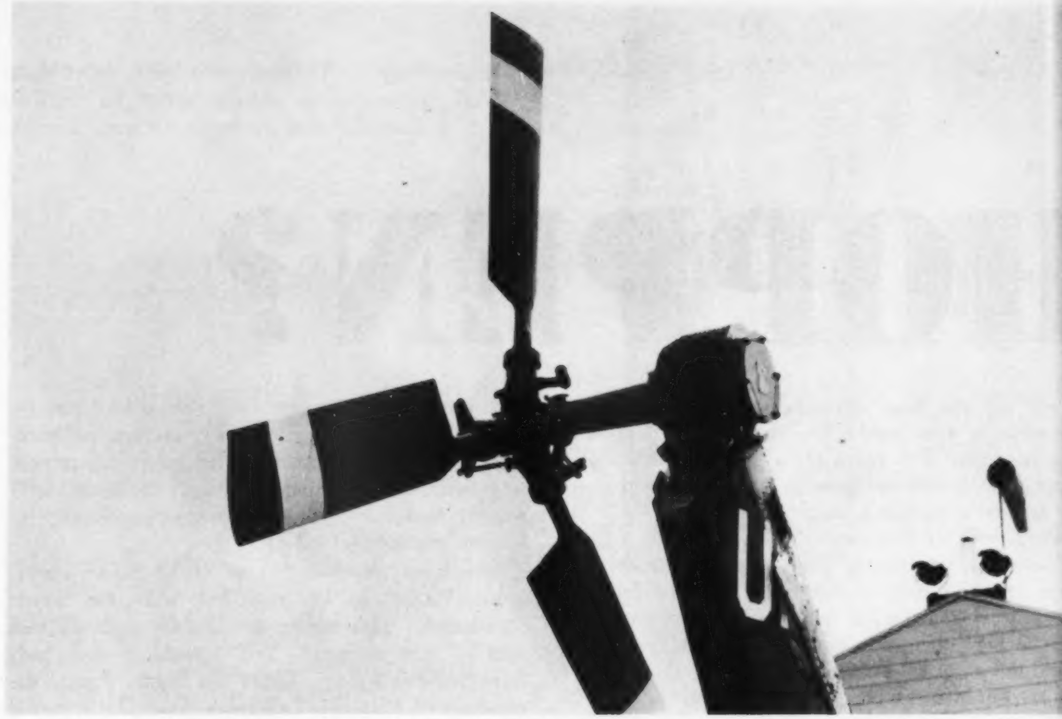
During first engagement following replacement, the helo began rocking violently. Following an immediate shutdown, inspectors found 3 of the 5 Positioner Snubbers, PN 8245, installed *backwards*. The direction-of-flow decals on the outside of the valves showed direction of restricted flow toward the manifold vice toward the damper as specified in the Maintenance Instructions NW 01-230HLC-2-6.

The reporting unit recommended exclusive use of the alternate specified valve, PN 1143, which has 2 arrows *stamped* on it, one showing direction of *free flow*—the other, *restricted flow*.

Don't worry yourself into a coronary while you're thinking of a corollary for this one.

In still another case, inspection of a P-3A's No. 2 engine fire extinguisher system, the cartridge electrical connector appeared to be cross-connected to the No. 1 engine system according to the decals.

Further troubleshooting revealed the decals were reversed and not the electrical connectors. The misinstallation occurred either during aircraft manu-



Murphy's Law prevailed—H-2 tail rotor (perpendicular) blade is installed backwards. Right: H-3 blade is correctly stencilled and correctly installed but beware of a misapplied stencil!

facture or while the aircraft was undergoing PAR.

Recommendations include:

- Checking all decals for proper installation,
- Checking for proper connection of electrical cartridges, and
- Use of the existing clamp to limit the length of the electrical leads to prevent reversal.

Hydraulic fluid discovered in the aircraft heater of a C-117D following turnup disclosed cross-connected hydraulic and fire extinguisher lines due to the reversal of color codes.

In older aircraft such as the C-117, history is resplendent with similar situations. In newer aircraft we have a degree of protection against Murphying the hydraulic system. Here are some excerpts from design specification Mil-H-5440D concerning reverse installation:

"Components which may inadvertently be installed reversed, without the condition being certain of discovery by a routine system check (as specified in the MIM) shall be so designed that they cannot be installed reversed. Even if reversed installation is detectable by routine check, and if the result of such check can cause system damage that may not be noted, irreversible components shall be used."

"Components, such as one-way restrictors, flow regulators and filters, shall each have a permanent placard on adjacent equipment or structures, visible with component installed, to indicate the correct direction of installation. Arrows on connecting lines are not sufficient for this purpose."

"The direction of flow in lines leading to and from each check valve shall be clearly indicated by arrows on each line, or, if the structure immediately adjacent to the check valve is not visible, a visible placard shall be provided to indicate direction of flow."

"Self sealing couplings installed adjacent to each other shall be of different size, or be otherwise designed so that inadvertent cross-connection of the lines cannot occur."

"Where two or more lines are attached to a hydraulic component and incorrect connection of lines to the component is possible, the two lines shall be sufficiently different, where practicable, to prevent such an occurrence."

Even in newer aircraft, built since the issuance of Mil-H-5440D, you can expect the unexpected. For instance: A P-3B aborted takeoff when the airspeed indicator failed to function—the pitot and static plumbing had been cross-connected at the instruments. Although the aircraft has excellent Murphy protection along the plumbing, that is, the pitot

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If a stencil can be applied on the wrong side, someone will stencil it that way.

system has 5/8" B-nuts and the static 3/8" B-nuts until they connect to the gage; at the gage both are connected with identically-sized (3/8") fittings. Murphy protection is lost when airspeed indicators are replaced. It was recommended that the diameter of the pitot nipple and corresponding gage be increased.

The foregoing are but a few examples of what can and does happen when we rely totally upon color-codes and stencils applied by the other guy. As is evident, these are easily misapplied if people do not adhere to applicable drawings and specifications.

To be sure:

- Don't trust color codes alone
- Don't trust decals
- Don't trust even yourself

When installing or reconnecting components, *rely on the HMI*. Above all, always perform a functional check.

Murphied Murphy

Also, "If a photo can be labeled wrong, someone will label it wrong." With a red face we have to admit we did it in the July issue (p. 45).

The J65 Murphy photos *were transposed*. Please correct your file copies.

Quick to bring the goof to our attention were maintenance pro's: CDR J. E. Ortiz, NAS New Orleans, MAJ C.W. Ward, MARTD Memphis, Fred Haynes, WAD RepLant, ADJC R. G. Rosenbery, NavAirLant, ADJC D. L. Hawkins, Jacksonville, ADRC D. M. Clary, Jacksonville, ADJ1 W. D. Ward, Cecil Field.

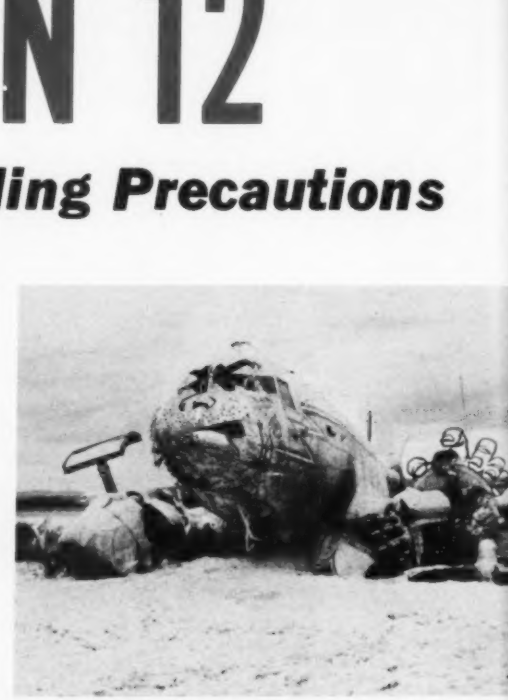
FREON 12

Safety and Handling Precautions

With the advent of the E-2A series aircraft which use Freon 12 to cool its black boxes, questions have arisen concerning what precautions must be taken with this type of refrigerant.

A review of applicable documents reveals the following information.

- AN 06-20-2, Gas Cylinders, Use, Handling and Maintenance, defines dichlorodifluoromethane or Freon 12, its commercial name, as a colorless and odorless gas. It is nonflammable, nontoxic, nonexplosive and does not support combustion. The harmfulness of breathing Freon 12 is questionable. It is considered less toxic than other halogenated hydrocarbons. It is used as a refrigerant and as a means of propelling compositions found in ordinary aerosol cans. It is shipped in a liquid state.
- All refrigerants whether toxic or nontoxic, are hazardous to the extent that they can cause suffocation by oxygen deficiency. Mil-Std 1247, Identification of Pipe, Hose and Tube Lines for Aircraft, Missiles, Space Vehicles, and Associated Support Equipment and Facilities identifies Freon as one of the physically dangerous (PHDAN) materials; that is, materials not dangerous in themselves, but are asphyxiating in confined areas or are generally handled in a dangerous physical state of pressure or temperature.
- Should personnel be overcome due to lack of oxygen in working spaces because of high concentrations of Freon gas being present such personnel should be given artificial respiration as in the case of suffocation.
- Freon refrigerants, while not toxic will decompose into toxic products if the vapor should come into direct contact with an open flame of high temperature (about 1000° F).
- When handling Freon 12, protective equipment (apron, gloves, goggles and face mask) must be worn.
- If liquid Freon 12 comes into contact with the skin, treat the skin as frostbite.



Who left my shaving cream on the radiator?

- If liquid Freon comes into contact with the eyes, call a doctor and use the following first aid treatment: Do not rub or irritate the eyes; drop sterile mineral oil into the eyes and wash the eyes with boric acid solution if the irritation continues.
- Freon 12 acts as a solvent when in contact with natural rubber. Never use substitutes for recommended gaskets, O-rings, or seals.
- *Leak Test*—To detect leaks in Freon systems a harmless dye or odorant is introduced into the system; leaks will be detected by escaping dye or odor.
- Mil-Std 101A, Notice 1, Color-Code for Pipelines and for Compressed Gas Cylinders indicates there are 8 types of Freon gases. On at least one occasion, Freon 22 was inadvertently substituted for Freon 12. Expansion rates for these two gases differ widely; for example, in 95°F temperatures Freon 12 expands to 108.4 psi; Freon 22 to 183.6 psi. Inadvertent use of the wrong type Freon could conceivably result in damaged equipment and personal injury. In the case just mentioned, an alert Tech Rep detected the error before servicing had commenced.

Freon gases are stored in cylinders color-coded *orange* under Mil-Stds and *white* under ICC standards for identification. The Mil-Standards require lettering, in addition, to exactly identify the type of Freon. Gray striping (bands) indicates PHDAN material.

Field surveys indicate there are some inconsistencies or nonstandard markings presently in the system. This matter was recently brought to the attention of proper authorities and it is expected the situation will be improved. It was also recommended that Aircraft Support Equipment (servicing bottles and carts painted yellow) be marked in keeping with the Mil-Stds. If you can't identify the gas as Freon 12, don't use it in your aircraft.

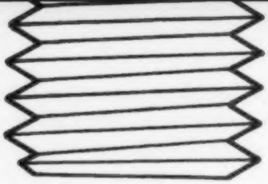
• *Handling Cylinders*—Cylinders containing this gas are of 10- and 25-pound capacity. Handling and refilling rules are as follows: should it become necessary to withdraw Freon from refrigerating systems into cylinders, care should be taken to avoid overcharging cylinders. Only empty Freon cylinders should be used for this purpose, and in order to be sure they are empty their valves should be open and the cylinder vented (in the open) for a few minutes. Prior to attaching the cylinders to systems which are to be emptied, they should be carefully weighed and the tare (empty) weight noted. The cylinders may then be connected to refrigeration systems for filling, but should be weighed from time to time while filling in order that not more than the appropriate weight of gas be charged into the cylinders. If any cylinder be accidently overfilled, the excess gas should be discharged slowly into the open, where any escaping gas vents into the atmosphere.

• Cylinders should be handled carefully because the pressure inside depends upon the ambient temperature. Refrigerant cylinders should not be exposed to high temperatures or flame. Containers that are used for high-pressure liquids should never be thrown around, dropped, or used for anything other than their intended purpose. Never fill a refrigerant cylinder to more than 85 percent of its capacity.

Freon bottles all—left is color-coded orange; center, white; and servicing bottle right, yellow.

References:

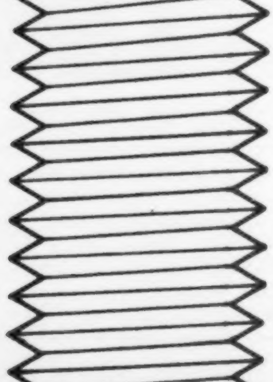
1. NavSo P-2455 Safety Precautions for Shore Activities, 0222.2a
2. AFM 127-101 USAF Ground Safety Accident Prevention Handbook
3. NavWeps 01-85WBA-2-1, Maintenance Instruction Manual, E-2A, Para. 6-44.
4. AN-06-20-2 Gas Cylinders, Storage Type, Use, Handling and Maintenance.
5. Mil-Std 1247 Identification of Pipe, Hose and Tube Lines for Aircraft, Missiles, Space Vehicles and Associated Support Equipment and Facilities.
6. Mil-Std 101A, Notice 1, Color-Code for Pipelines and for Compressed Gas Cylinders.



Knowing how to replace damaged studs and threads in airframes, engines and accessories can save you many hours in returning your birds to an UP status. Here's some good dope on the why and how of replacing

Tired Threads

By R. F. Fraser and H. J. Weston, Rosan, Inc.



Threaded inserts and step studs are used to replace, protect and strengthen tapped threads in steel, magnesium, aluminum and plastics.

Because aircraft and engine fasteners are constantly at work, vibration and stress subject the fastener to various loads at varying frequencies. Eventually, the fastener holding two structural members together can become fatigued and the joint fail. Designers provide for this possibility by designing into each assembly a particular fastener which when properly installed, will provide a clamping force greater than the maximum anticipated loads. Under proper conditions, fatigue will be kept to a minimum and the integrity of the joint is guaranteed beyond the life of the aircraft.

In order to maintain this integrity we must be sure that during overhaul and especially during field maintenance and emergency repair operations, the proper fastener is replaced and assembled to the proper torque. If the original nut does not engage the original bolt freely, we are immediately suspicious of one or the other. If a thread gage is not readily available, the usual procedure would be to replace one or both members with new parts of the same specification.

This is not done so easily when we are dealing with bolts and tapped holes. We can inspect the bolt visually and be reasonably sure of its condition. If threads are marred, damaged or excessively worn, or cracks are in evidence, the bolt should be replaced. If a new or perfect bolt does not assemble into the tapped hole, the hole should be inspected for damaged threads, corrosion, or cracking. Cleaning out the hole with a tap will not solve any of these conditions. Failed, damaged or corroded threads will be removed or sized, but their resistance to shearing could be reduced to a point which will assure joint failure.

Corrosion is the most common cause of thread deterioration, but we also find many occasions in which threads have been partially failed through overtorquing, or insufficient engagement, cross-threaded or galled. In any of these cases, it is seldom necessary to discard the complete part, because of poor threads, or is it necessary to drill and tap to a larger bolt size; an operation which is not always practical.

The use of threaded inserts will usually salvage the part and provide a joint superior to the original equipment, while still using a bolt of original size and specification.

Under today's technology it is imperative that we develop maximum strength with a minimum expenditure of weight. This calls for fastener performance as predicted by the design engineer. Each

joint must be held together with the proper preload, or clamp-up, otherwise failure is imminent. In order to develop that preloading the fastener must be of proper strength, properly assembled to the designated torque. Threads must be in perfect condition. Replacement of that tired thread is essential to the continued performance of the aircraft or engine.

To acquaint you with the mechanics of thread and stud replacement, here's a rundown on the ring-locked principle:

The ring-locked stud is a step stud: the threads that are assembled into the parent material (stud end are one size larger in diameter than the protruding threads (nut end). For example, the 1/4-28 nut end has 5/16-18 stud end thread. Between the threaded portions there is a serrated flange that looks like a knurl or gear teeth (Figure 1). The

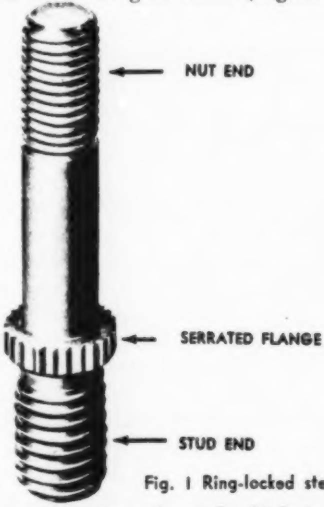


Fig. 1 Ring-locked step stud

lock-ring is a thin ring of metal which is serrated internally to mesh with the stud flange serrations (clearance is provided). The external diameter of the ring is also serrated with the side that enters the parent material undercut, and acts like a broach as it cuts its way through the parent material (Figure 2).

At Your Service

Product Information and Tool Application Seminars are conducted by Rosan, Inc. to demonstrate the proper methods of repairing threaded holes and inserts.

Some activities that have benefitted from such presentations are: NAS Jacksonville, NAS Pensacola, MCAS Cherry Point, NAS North Island, NAS Quonset P., NAS Lakehurst and NOTS China Lake.

The company has extended an open invitation to all naval installations interested in this type program. Please contact the authors for further details at:

Rosan, Inc.
2901 West Coast Highway
Newport Beach, Calif. 93663
Telephone: LIberty 85533

The ring-locked stud has the following qualities:

- Will not loosen under vibration, heat or stress.
- Installation is simple and positive.
- It is necessary to change the ring-locked stud only when the nut end threads are damaged.
- The same sized stud is used for replacement.

Stud Fitting

Here are some pointers that may be helpful:

▶ The stud end thread pitch diameters of the ring-locked stud are larger than the diameters prescribed by the Unified National Thread System. They were designed that way so that a transitional (clearance or interference) fit would occur in aluminum or magnesium that had been tapped to Standard National Class 3 thread limits. This provides a rigid stud that will not wobble. When a ring-locked stud is installed, a torque or resistance will be felt.

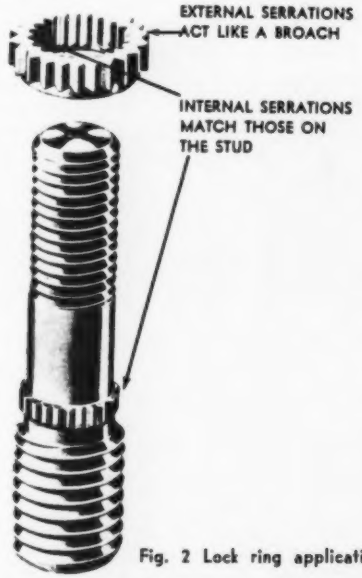


Fig. 2 Lock ring application

▶ If the proper installation wrench is not available, select two nuts that will fit the thread end. Install both nuts, using two open-end wrenches to tighten the nuts against one another. Then use a rachet or box end wrench to install the stud in the tapped hole.

▶ Be sure to install the studs so that the top of the serrated flange is from .010 to .020" below the material surface. This must be done to avoid impact of the lock ring drive tool, which may contact this serrated flange (Figure 3) and transmit the load to the tapped threads in the parent material. This

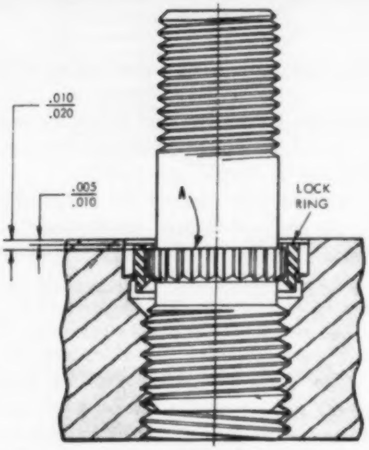


Fig. 3 Ring-locked stud installed properly

could cause a loose stud.

▶ If a ring-locked stud is to be used in a ferrous material (cast iron or mild steel), it is advisable to use a clearance fit in order to install the stud. Aluminum is more malleable than steel and, with the larger thread pitch diameters on the stud end thread, excessive thread interference might prevent installing the standard ring-locked stud into a Class 3 tapped hole in steel.

▶ Table 2-6, T.O. 44H1-1-13, C' Bore Diameters for Magnesium Parent Materials is important for several maintenance reasons. When aircraft manufacturers began using magnesium extensively, it was found that if the standard, specified, counterbore diameters were used, two things happened when the mechanic tried to drive the lock-ring into place. First, it was extremely difficult to seat the lock-ring because it was cutting too much material at one time. Second, when the ring was finally installed, a material bulge usually appeared around the external serrations of the ring.

To solve both problems, the counterbore diameter was increased from .006 to .015″ on the diameter, depending on the size of the lock-ring and the number of serrations. The increased diameter made for an easier installation with no bulging. Later, tests have shown that even the magnesium counterbore diameters can be used in aluminum without degrading stud performance. This also provides an extra margin of tolerance in reworking aluminum parts.

Stud Removal

Sometimes it may be necessary to remove a ring-locked stud because of the damaged nut end threads.

Fig. 4 Hollow mill removal tool

T.O. 44H 1-1-13 prescribes correct procedures, but here are some additional hints:

- The hollow mill removal tool, Figure 4, can accomodate a stud length of from 1 and 7/16 to 2 and 11/16″. If the stud is longer, cut it off except for a stub protruding above the surface about ¾″. This will serve as a guide for the hollow mill.
- The hollow mill should be used in a drill press. Hand drills are hard to hold in a true, normal position and there is no RPM control.
- A light force should be used, with frequent removals to allow for chip clearance. Air blast will best remove the chips. *Be sure to wear safety glasses.*
- The lock-ring serrations *should not* be cut through completely. This tends to dull and possibly chip the mill. Three-quarters of the way through the lock-ring is enough.
- Use a vice grip or other appropriate tool to grip the stud and rotate it in a counterclockwise direction. The stud will back out and lift the ring with it.

The foregoing method of supplying "new threads" is thoroughly covered in T.O. 44H-1-13, Technical Manual, General Use of Rosan Fasteners, available through the use of Publications and Forms Order Blank (NavWeps 140).

Section I of this manual provides "instructions for the use of Rosan Slimsert inserts and appropriate tools for original installations, repair of parts and assemblies with worn or damaged threads, and for replacement of helical wire-type inserts." (Par. 1-1).

Section II covers ring-locked studs. "These parts are especially suited to the replacement of size on size studs which have become loosened or damaged." (Par. 2-5.)

Section III provides instructions for installing the ring-locked insert. This insert has a larger external diameter and can be used in those areas with ample edge distance around the damaged holes. For areas with limited edge distance refer to Section I of the Manual.

References:

T.O. 44H-1-13, Technical Manual, General Use of Rosan Fasteners.
T.O. 1-1A-8, Structure Hardware Manual, Section IX.
Mil-S-45909, Ringlock Studs.
Mil-I-45910, Insert, Screw Threadlocked in and Ring-lock Serrated.
MS 51989, Stud, Locked in Ringlocked Serrated.
MS 51990 Ring-lock Serrated.
MS 51991 Insert, Screw Thread Locked in, Ringlocked, Serrated.
MS 51994 Hole Preparation, Ringlocked Inserts and Studs, Standard Dimensions for.
MS 51995 Fasteners, Ringlocked—Inserts and Studs, Installation of.

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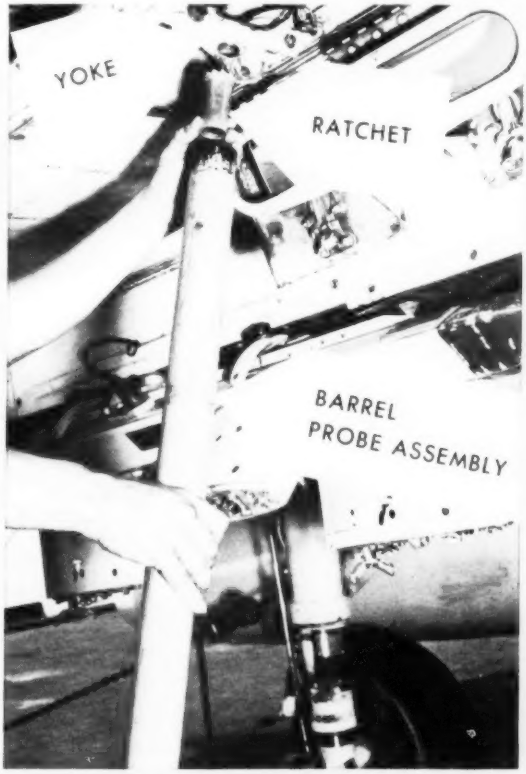
Probable FOD



A missing starter probe driver rachet of the type shown here became highly suspect in A-4's engine failure.

AN EXPLOSION following sustained high EGT readings forced an A-4C pilot to eject at sea shortly after takeoff. He was rescued successfully and returned to his ship uninjured. A review of the events that occurred on deck just prior to launch revealed a hint of FOD.

After a normal lightoff, the starting probe was removed from the A-4 and taken aft to another aircraft. When the probe handler attempted to connect it there he discovered that the probe driver rachet assembly was missing.

Knowing that the parts had to be in the probe to start the first aircraft, the handler retraced his movements. He was unsuccessful in locating them, either on deck between the aircraft or underneath the first A-4 he had started. Since the flight deck was dark, engines were turning and aircraft taxiing, the probe handler decided that the parts were either lost in the dark or blown over the side. It did not occur to him that possibly one or more of the pieces could be in the intake of an aircraft that was just then being positioned on the catapult.

The conclusion of starter probe FOD being the cause of the accident cannot be confirmed since the aircraft was lost and no wreckage recovered. But careful investigation has determined that it is mechanically possible for all of the missing probe parts to remain in the intake following normal start if the cotter pin fails and the nut either fails or backs off. If such were the case, compressor failure induced by FOD is highly likely.

The importance of inspecting probes before and after each start should be reemphasized to ground crews, along with the need for reporting any discrepancies they observe in aircraft preparing for takeoff.

NOTES

and comments on maintenance

This is where things came loose.

Landing Gear Failure

UPON touching down on a normal landing, an A-4B pilot felt the port wing drop and the aircraft entered a left swerve. Suspecting a flat tire on the port main mount, the pilot poured on full power and got the *Skyhawk* safely in the air again. Inspection by another A-4 pilot revealed that the port MLG assembly was disconnected from the strut and the mount was trailing aft about 30 degrees from the vertical.

The pilot decided to make an emergency landing into the E-5 arresting gear on a foamed runway. The nose and starboard wheels were retracted and a routine arrested landing was made on the two 300-gallon drop tanks.

Investigation revealed that the port MLG strut and the associated lower drag link separated while the spherical bearing still maintained its connection to the strut. This was caused by the failure and/or loss of the internal retainer ring, which was not recovered for detailed inspection.

Resulting recommendations were that inspections be conducted daily to ensure that the internal retainer rings are properly installed and secured.

Drop tanks saved the day.

Swallows Tie-Rod Cover

ON FINAL approach to a routine landing, the pilot of an A-3B noted fuel flow to be 2200-2500 lb/hr. Then a slight addition of power was required and the starboard engine did not respond. A recycling of the throttle movement again produced a chugging noise which was indicative of a possible compressor stall. A moment later, the fuel flow of the ailing engine went to ZERO.

Fortunately, the good port engine had sufficient power to drag the aircraft through the final approach and safely onto the runway.

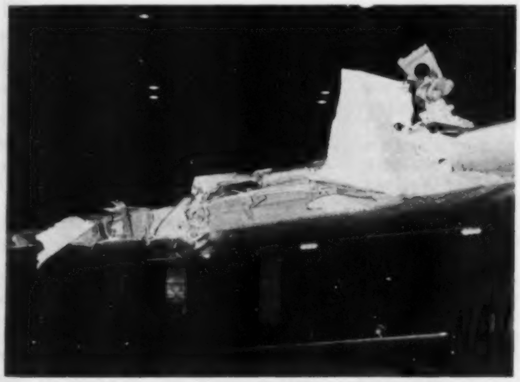
Cursory inspection revealed numerous pieces of

metal parts in both bleed air ducts of the starboard engine. Smaller metal particles were found in the tailpipe. The front tie-rod cover plate to the rear compressor was missing and, by being ingested in the engine, provided the damaging FOD.

The tie-rod separated at the outer diameter about an inch from the air seal. Future inspections should include means of insuring the security of the tie-rod cover.

Rocket Pack Troubles

DURING a close air support training mission, the pilot of an F-8E was making a 4-G pullout from a strafing run. When almost back to level flight indicating 175 kts he felt a jolt and an immediate right wing drop. Fortunately, positive control was



LAU-33A Zuni pack separated from the launcher striking the wing. A safe landing was made.

still available and the aircraft was climbed to a comfortable altitude for visual inspection by another *Crusader* pilot. Meanwhile, the utility hydraulic system pressure went to ZERO. The LAU-33A Zuni pack (with two unfired rockets within) had inadvertently separated from the LAU-7/A launcher and struck the leading edge of the starboard wing in the vicinity of the wingfold.

Slow flight checks revealed a safe landing could be made in the wingdown position. Subsequently, an uneventful arrestment was made into the E-15 gear.

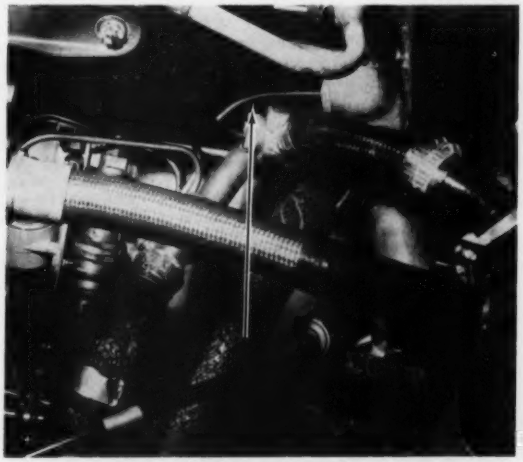
Since there already was a history of similar rocket pack losses, it was suspected that the most probable cause of this incident was improper installation before launch. The design of the LAU-33A Zuni pack prohibits a visual check to see if the aft lug of the LAU-7/A locking mechanism has seated behind the block on the rocket pack. A modification to the LAU-33A to provide a positive lock has been approved and is available. Aircraft Armament Change 425, Revision A of 20 May 1966 and Interim Amendment 2, NavAirSysCom msg 212225Z April 1967 apply. A new LAU 33A/A is scheduled for fleet use. Meanwhile, ordnance personnel must make every effort to insure a positive hookup.

Whose Dikes?

DURING some airborne tactics, the pilot of an F-8E suddenly discovered his throttle seemed to be jammed short of the full forward position. A glance at the instrument panel revealed that maximum engine RPM was 90 percent. Although all other instruments were normal, the pilot felt it was wise to abort the mission and go home. He made a successful landing into the morest as a precautionary measure.

A few minutes after securing the aircraft, the trouble was located. A pair of diagonal cutting pliers were found jammed in the throttle linkage just forward of the fuel control.

Inventory your tools before and after each job. Missing tools do not cost much but lost airplanes do.



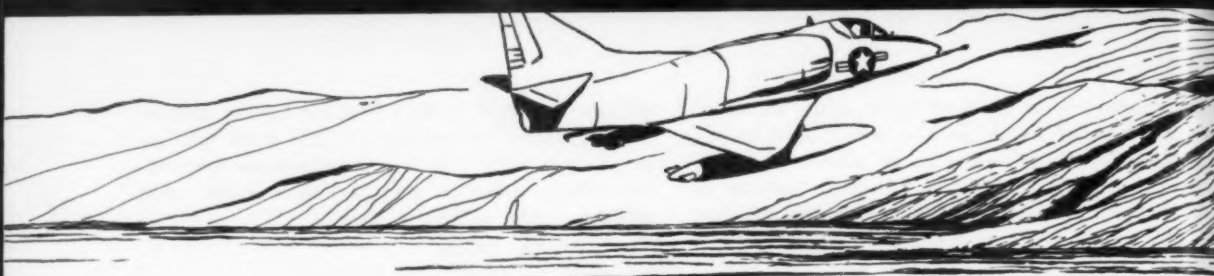
Diagonal cutting pliers caused throttle jam.

Tooled Right?

A MECHANIC is a man of considerable brainpower who has developed a great deal of technical skill partly through his ability to renovate machinery aided by certain extensions to his arms called tools.

Since these extensions provide a leverage and grip advantage, they can be turned into metal rending monsters if placed in the wrong hands, or if the wrong tool is used by the right hands. Our job is to have the right tools in the right hands at all times.

How do you stack up?



Letters

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request.
Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. 23511. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.

Exploding Mae Wests

FPO New York—In reference to the article, "Pop Go The Flares," page 7 of the April issue, I most heartily concur. The enclosed photos will serve to reemphasize how heat from aircraft heater diffusers can affect CO_2 cartridges in life vests.

This mishap occurred on a night VFR cross-country in an SH-3A aircraft. The crew had stored their mae wests on top of the AQS-10 Sonar Stack since the cross-country flight path was primarily over land. One of the stowed mae wests slipped from its position and was later found to be resting against the port side heater diffuser.

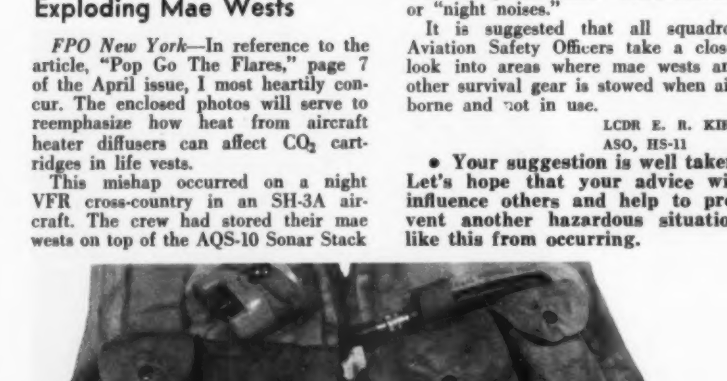
Fortunately the loud pops (explosions of the CO_2 cartridges) were investigated and corrective action taken prior to ignition of the Mk-13 Mod-O day-night signal flares.

I am happy to forward on to you the photos which show the end result of what the pilots called "weird sounds," or "night noises."

It is suggested that all squadron Aviation Safety Officers take a closer look into areas where mae wests and other survival gear is stowed when airborne and not in use.

LCDR E. R. KIRK
ASO, HS-11

• Your suggestion is well taken. Let's hope that your advice will influence others and help to prevent another hazardous situation like this from occurring.



Heat soaking caused CO_2 cartridges in stowed mae west to explode during cross-country flight over land.

Knurled CO_2 Cylinders

MCAS, Yuma, Ariz.—The recommendation to increase grip-friction on CO_2 cylinders is good enough, but to knurl the cylinder may be a poor idea. As I remember, the cylinder contains compressed gas at about 800 psi—no small dynamite bomb. The act of knurling affects the cylinder in at least two ways:

(1) the metal is asymmetrically crushed, thereby setting up stresses and strains best seen in a plastic model under polarized light. These stresses, in addition to that of the contained pressure, may lead to subsequent failure of the cylinder.

(2) at the bottom of each knurl-groove is a variously sharp V-cut in the metal. As in propellers (remember?) these sharp cuts serve to localize stress at the bottom of each cut, causing running fatigue cracks from such points, and possibly leading to explosion of the cylinder.

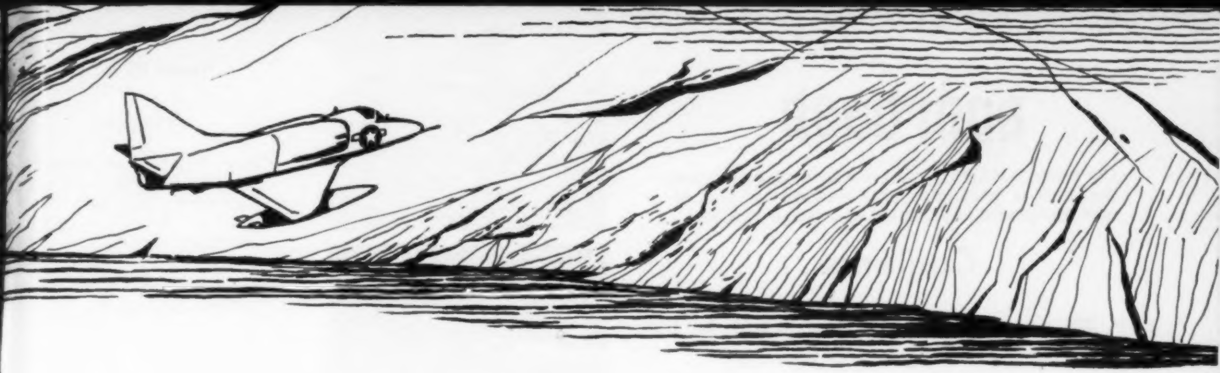
It is recommended that CO_2 cylinders not be knurled before the matter has been studied by a proper testing lab.

LCDR F. C. WARE

• We agree with you that the procedures suggested in the April 67 issue letter to Headmouse "Knurled CO_2 Cylinders," should be tested before being used. We referred the matter to the Naval Air Development Center and received the following statement from its Aerospace Crew Equipment (ACED): "Due to recent URs on inadvertent rupture of CO_2 cylinders during flight and the possibility of weakening the CO_2 cylinder by the knurling process, this method to increase grip-friction is not recommended. As a substitute to the knurling process, ACED will forward results of tests now underway to provide an acceptable method to be performed at the squadron level."

"Survival Radios"

MCAS, Beaufort, S. C.—I would like



to thank you very much for printing "Survival Radios" in the May issue of your magazine.

Since returning to CONUS I have noticed the great difference between survival equipment used in CONUS vice WestPac. With this in mind I would like to recommend that a special allowance be set up for new items of survival equipment. I realize that this equipment should go to WestPac as soon as possible but there is also a definite requirement for this equipment in CONUS as all replacement aircrewmen are trained here. My recommendation is that all Aviation Physiological Training Units be issued one each of every new item such as the RT-10A survival radio and SEEK-II survival kit. These two particular items have been in use by the First Marine Aircraft Wing for almost a year and most aircrewmen who have never been to WestPac have never seen either item.

I am presently the water survival training officer for the Marine Corps Air Station and the survival training officer for the Aviation Physiological Training Unit. I talk about this equipment constantly and would really like to be able to show the trainees these and other new items of survival equipment.

I also feel the survival equipment world is missing out on quite a bit of valuable feedback especially regarding the RT-10A survival radio. For instance, the first pilot in my article, "Survival Radios," who was downed twice, had quite a bit more to his first experience than I reported. After being downed near friendly Marines he immediately realized he was the only officer present and took command of a tight situation. Throughout the night, using his RT-10A, he called in air strikes and Med Evac helos and led the Marines out of this tight situation. This pilot was recently awarded the Navy Cross for this particular experience.

I really don't know how to overcome this feedback loss as I understand that Medical Officer's Reports are not required in combat.

2ND LT ARTHUR L. KENT, JR., USMC

• The Safety Center will query the Bureau of Medicine and Surgery (which has cognizance over the aviation physiology training units) on the acquisition of new equipments.

On the subject of feedback on survival equipment in combat areas, where Medical Officer's Reports (MORs) are not required, we pick up some information from message traffic and correspondence. Occasionally, through various channels, we receive unclassified survival narratives which we can use in . (In the "Letters to the Editor" section of the March issue we solicited such narratives from fleet operating squadrons.)

The Safety Message on Coffee Cups.

Safety Cup

NAAS Kingsville—I am enclosing a picture of a few items created for the safety program of VT-23 under the title of Drinkability and Safeability. The coffee cup lends itself to various uses, one of which is holding a person's attention every time he raises the cup. Any general safety idea may be used, as well as specifics—EGTs, oil pressures or any emergency procedure. It's another available item that can be used to create interest in one's Aviation Safety Program.

LT T. A. MYERS
ASO, VT-23

• We've seen the safety message spread on paper cups in the past, now here's an advanced application using ceramics. The idea of using readily available items to plug safety is a good one. Barring tattooed women anything that can hold the attention of the person using it qualifies. Anyone else have any ideas?

Pen Gun

FPO New York—Naval and Marine aviators living in the "now age" are equipped with more and better survival/emergency equipment than ever before. Improvement of present systems and development of new concepts are fields that are virtually unlimited. To name a few devices that we now have, there are radio beacons, anti-exposure suits, Nomex flight garments, strobe lights, safety-toe flight shoes, etc., etc. However, one item that has not been received as well as I feel it should have is the Mk-79 pen gun which just happens to be my subject.

In the early life of the pen gun, a series of unfortunate accidents occurred as a result of improper use, handling and flight clothing stowage. Improvements were made.

With the exception of the old standard mirror and the new strobe light, I cannot think of a single superior visual signaling device. Yet there are operational commands who have not authorized their flight personnel to use the pen gun. For noncombat flying some commands no longer require flight crewmen to carry the .38 caliber, tracer-equipped revolver. Most VS squadrons are equipped with the old "over the shoulder, around the neck" holster arrangement. This is fine if it is the only device available, but a word of advice here: pilots/aircrewmen, take caution as to what you have suspended around your neck; you may find yourself hanged in suspense!

Users of the pen gun should know and nonusers should be aware of the potential value of the pen gun. There is no comparison between the .38 caliber pistol and the pen gun so far as displacement, associated discomfort, and weight of the pistol is concerned. Far above that are the functional capabilities of the pen gun vice the pistol.

LTJG H. W. DIXON
SURVIVAL/AVIATOR'S
EQUIPMENT OFFICER
AIRANTISUBRON 32

Vol 13 **approach** No 2

Our product is safety, our process is education and our profit is measured in the preservation of lives and equipment and increased mission readiness.

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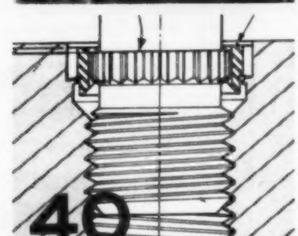

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Refresher

In summers past, considerable emphasis has been placed on jet engine power loss due to higher runway temperatures. Even so, the first hot spring or summer days usually find us having at least one premature gear retraction or similar takeoff bust somewhere. So, here are the thumb rules of power loss.

Hot Weather Takeoff Thrust (Jet)

Compressor Inlet Temperature (°F)	You get		% of Thrust Available at 100% RPM
120°	"	"	81.6%
110°	"	"	83.9%
100°	"	"	86.9%
90°	"	"	89.7%
80°	"	"	92.9%
70°	"	"	96.3%
59°	"	"	100.0%

Don't be unconscious . . .

be FOD-conscious!

Make every walk a walkdown!